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Overlooking Great Harbor

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OVERLOOKING GREAT HARBOR

SOME TORPEDO PROBLEMS FOR DESTROYERS

BY LIEUTENANT COMMANDER H. H. FROST, U. S. NAVY

THERE are four principal requirements for the successful use of torpedoes in action by destroyers:

1. To design and maintain all torpedoes so that they will carry the maximum weight of explosive and run the necessary range with moderately accurate course, speed and depth every time they are fired.

2. To select and gain the most favorable positions and times for firing.

3. To determine correctly the sectors in which our torpedoes will have the greatest effect upon the course of the action being fought.

4. To use a positive and rapid system of torpedo control to fire torpedo salvos of the full volume available.

The following characteristics are recommended for torpedoes to be carried by destroyers:

1. Absolute reliability; this is of primary importance.

2. Maximum weight of explosive in warhead; at least 600 pounds should be used.

3. Moderate range; 10,000 yards is sufficient.

4. Moderate accuracy; 500 yards deflection at 10,000 yards run is satisfactory.

5. Variable speed; moderate speed at long range and high speed at short range; moderate accuracy of speed, one knot being not an excessive error.

6. Suitable depth control to prevent broaching and running at excessive depths.

Of these characteristics reliability is by far the most important; circular runs, cold shots, broaching and runs at excessive depths should be unknown; our first problem is to prevent these faults rather than to develop long range and absolute accuracy of course and speed; the importance of absolute reliability cannot be too strongly stressed.

The water-tight integrity of modern ships has been so improved that capital ships will be able to withstand from three to five hits of our present torpedoes and from two to four hits will be required to sink a light cruiser. It follows that we must not only hit with torpedoes, but hit with the largest possible weight of explosive in our warheads. In the same way that guns have been increased in size so that their hits will be more effective, the explosive charge of torpedoes must be increased to the highest limit. The minimum should be 600 pounds. This should take priority over all increase in range over 10,000 yards and over all other requirements except reliability.

Moderate range is all that is necessary; 10,000 yards is sufficient for the straight run of the torpedo; more than this will encourage fire at excessive ranges and will operate to decrease the weight of explosive. It is necessary, however, that the torpedo should run every time the moderate range specified. To this end cold shots must be absolutely eliminated and any alterations to effect this should be made regardless of what radical steps may be involved. The prevention of cold shots is a problem with which we have been struggling ever since the invention of the heated air torpedo and it would appear that there are a greatly excessive number of them at present.

Exact or nearly exact accuracy in the course of the torpedo is unnecessary. A torpedo which has a lateral deflection of 500 yards at 10,000 will have an inappreciable error for a short range shot, and when fired at long range in action it has exactly as much chance of hitting an actual ship in the target as one with zero deflection. All that is necessary is that torpedoes keep within the approximate area covered by the salvo of the attack unit. On the other hand, all circular or erratic runs—before the torpedo has run its designed straight course range—must be absolutely pre-

vented. If necessary, accuracy in the course of the torpedo must be sacrificed to obtain the necessary reliability of the vertical steering mechanism.

Moderate speed will have to be accepted for long range firing because it cannot be increased without sacrificing other more important characteristics. For short range firing, however, where a single ship is selected as the target, high speed is very important and in this case it should be obtained by reducing the range. All torpedoes for destroyers should be designed so they can be fired at two and preferably three speeds, the setting to be made without withdrawing the torpedo from the tubes. A suggested combination of speeds would be 28 knots for 10,000 yards range, 35 for 5,000 yards and 42 for 2,000 yards. No originality is claimed for this idea, which is one of the usual characteristics of the Whitehead torpedo.

The depth control must be absolutely reliable. The Germans lost about five hits on British capital ships at Jutland because their torpedoes ran at excessive depths. On the other hand, the broaching of even one torpedo may allow the target to detect the presence of an entire salvo of thirty-six torpedoes. It is unnecessary for torpedoes to run at exactly their set depths, but four feet should be the greatest allowable variation.

The subject of firing positions has been handled in an official publication and it is necessary here to emphasize only the point that torpedo hits decrease in battle very rapidly as the run of the torpedoes increases and that it is impossible to be too close to the target when firing. It is also necessary that attack units which do not fire at point blank range should gain firing positions so their torpedoes will converge on the target from different directions. This prevents the target from maneuvering clear of all salvos and also reduces the chances of individual ships dodging torpedoes sighted close aboard.

The selection of the proper time to fire is as important, if not more important, than the firing position. It must be determined from an estimate of the tactical situation made sufficiently in advance so that the attack unit will be in the proper position and ready to fire at the proper time. The perfect timing of the German destroyer attacks at Jutland shows that they had given much attention to this most important problem.

The selection of the firing positions, the determination of the methods of approach to these positions and the time to fire are problems which can best be studied on the game board; they should be supplemented by tactical maneuvers.

We now come to the third requirement of torpedo fire: i.e., the determination of the sectors in which our torpedoes will have the greatest effect upon the course of the action. This subject will be treated in some detail. Many officers consider that they have only to estimate the course and speed of the target before firing and use this data on the director. Much attention has been given to methods of obtaining such data. While it is desirable to estimate the course and speed of the target before firing, it would be folly to assume that the target will oblige us by maintaining this course and speed steadily during the run of our torpedoes.

Assuming that torpedoes fired in a day action by destroyers will have an average run to the target of 5,000 yards, the duration of their run will be about five minutes. To this should be added a period of at least three minutes to cover the interval between the instant when the target's course and speed are estimated and the firing of the middle torpedo of the salvo. Should the course and speed of the target be signaled by the attack leader, this interval might be greater. However, it may be assumed without much chance of error that there will be an interval of at least eight minutes between the time when the target's course and speed are estimated and the time when the middle torpedo passes the target. In some cases, particularly when it is necessary to use an unfavorable track angle, this elapsed time will be much greater.

As an example of what may be expected to happen in action during a period of eight minutes a study has been made of the changes of course and speed made at Jutland by various representative units suitable for selection as torpedo targets. A table has been compiled to show the changes of course made during the action.

Name of Unit	Number of ships	Time engaged	Number of Changes	Average Time between changes	Average Change	Change in 8 Mins.
British Battle Fleet	24-27	2 h 30 m	17	8 m 48 sec	42°	38.4°
German Battle Fleet	22	4 h 00 m	21	11 m 24 sec	52°	36.0°
Battle Cruiser Fleet	4-6	4 h 45 m	28	10 m 12 sec	38°	29.6°
Fifth Battle Squadron	3-4	4 h 45 m	40	7 m 06 sec	34°	38.4°
German Battle Cruisers	4-5	5 h 00 m	44	6 m 48 sec	49°	57.6°
4th Light Cr. Squadron	5	2 h 42 m	33	4 m 54 sec	43°	70.4°
2d Light Cr. Squadron	4	4 h 45 m	36	7 m 54 sec	53°	53.7°

While these changes of course may appear to have been large and frequent, they were really less than may be normally expected in a future action, for the following reasons:

1. During the action there were many long intervals where the forces were but lightly engaged or not engaged at all, thus allowing steadier courses to be steered.

2. Very few changes were made by target units for the purpose of avoiding torpedo attacks, which are certain to be more frequent in future actions. In this table only changes of course by entire units have been entered; those made by individual ships to dodge torpedoes sighted close aboard have not been included.

3. As no submarines were present no zigzagging was done and no changes of course were made to avoid submarines sighted close aboard. A few changes may have been caused by erroneous reports of submarines.

Changes of speed are not to be expected in action with nearly the same frequency as changes of course, but still must be considered as possibilities. A table has been compiled to show the changes of speed made by representative units of the Grand Fleet.

Name of Unit	Average Time between Changes	Average Amount of Change	Average Change in 8 Minutes
British Battle Fleet	24 minutes	2.6 knots	.866 knots
Battle Cruiser Fleet	30 minutes	2.4 knots	.640 knots
4th Light Cr. Squadron	9 minutes	3.3 knots	2.933 knots

The German Battle Fleet made five changes of speed, but the amounts are not known. From an examination of these tables it will be evident that any torpedoes fired at above the point blank range of 600 yards will have little chance of effectiveness if the course and speed of the target as estimated before firing are used

on the torpedo director. On the contrary it must be set with such a course and speed of the target as will throw the torpedo salvos into a sector where they will have the greatest effect upon the course of the action. This involves a prediction as to the most probable plan of the target commander and the maneuvers which he will use to carry his plan into effect. Where a definite prediction cannot be made, this usually requires the filling of a certain sector so as to force the commander of the target to a choice between two evils, compelling him either to accept the risk of making our torpedoes effective or to place himself in a position where other portions of our forces will have important advantages over him.

It will prove convenient to group torpedo attacks into several classes which may be defined as follows:

1. Supported Attacks: In which the target ship or formation is engaged in a gunfire action with our units of equal or superior types, so it is able to devote only a part of its attention to avoiding the torpedo fire of our attack units of inferior type or types.

2. Unsupported Attacks: In which the target ship or formation is not engaged in a gunfire action with our units of equal or superior types, so it is able to devote its exclusive attention to avoiding the torpedo fire of our attack units of inferior type or types.

Each of these forms of attack may be subdivided into:

1. Co-ordinated Attacks: In which there are two or more of our attack units, of one or more types inferior to that of the target, making nearly simultaneous attacks from different directions on that same target ship or formation, which must divide its attention among the several attack units.

2. Single Attacks: In which there is but one attack unit of a type inferior to that of the target ship or formation, which can devote its exclusive attention to this attack unit.

The following may be cited as typical examples of these forms of attack:

1. Supported Co-ordinated Attack: A target formation of battleships or battle cruisers, while engaged in a gunfire action with our battleships, is attacked by several attack units of light cruisers, destroyers, submarines or torpedo planes from different directions.

2. Supported Single Attacks: A target formation of light cruisers, while engaged in a gunfire action with our light cruisers or aircraft carriers is attacked by one attack unit of destroyers, submarines or torpedo planes.

3. Unsupported Co-ordinated Attacks: A target formation of battle cruisers is attacked by several attack units of light cruisers, destroyers, submarines or torpedo planes from different directions.

4. Unsupported Single Attacks: An aircraft carrier is attacked by one attack unit of destroyers, submarines or torpedo planes.

As the most complete tactical situation occurs during a supported co-ordinated attack, this form will be examined as an example of the methods of estimating a tactical situation for the purpose of predicting the future movements of the target. The other forms of attack are similar, except that as some of our forces may be eliminated the estimate is more simple, although the tactical situation is less favorable for effective torpedo fire.

The officer whose duty it is to predict the future movements of the target must imagine himself in the position of the target commander and endeavor to view, as nearly as possible, the tactical situation through his eyes. The target commander in making his estimate must take into consideration the following units or groups of our forces:

1. Our own attack unit and, if any, other similar units of the same attack group attacking the target from the same direction.

2. Other distinct attack units or groups which are attacking or threatening attacks from directions different from our attack but in co-ordination with it.

3. Units or groups of our forces of types superior or equal to that of the target with which gunfire actions are being carried on or are impending.

It will first be desirable to determine whether the target commander will probably eliminate any of these units or groups from his serious consideration. If the gunfire action has been temporarily suspended by the laying of a smoke screen, the target commander might consider that he could neglect for a short period the units with which he had previously been carrying on his gunfire action and give his exclusive attention to avoiding the

torpedo fire of our attack units. On the other hand, if the gunfire action were being carried on at decisive ranges and our attack units were being successfully held off by the enemy light forces, the target commander would be justified in neglecting these attack units for the immediate future and devoting all his effort to the gunfire action. In the same way our particular attack unit might be concealed by smoke or low visibility from the target commander or he might think that its threat was so small in relation to the forces engaged that he could afford to neglect its presence. There were examples of all three such cases at Jutland.

After eliminating such units or groups as do not merit serious consideration, it will next be desirable to determine if there is one plan which the target commander can carry out which will be advantageous to him as regards his dealings with all our remaining groups or units. If there is such a plan, it should be easy to estimate what it will be. In this case, however, our torpedo fire will usually be ineffective, and it should be withheld until a later time unless we are in a particularly favorable position or there is some special reason for firing. An excellent example of such a tactical situation will be noted at Jutland between 4:30 and 4:40 P.M., when Admiral Hipper, by four simultaneous changes of course, disengaged his battle cruisers from an overwhelming force of battleships and battle cruisers and at the same time avoided a well executed torpedo attack. The torpedo hit received by the *Seydlitz* at 4:57 was made by a destroyer which temporarily withheld its fire until the tactical situation had changed.

We now arrive, by the process of elimination, to the usual situation where the target commander must devote his serious consideration to two or more units or groups and is unable to carry out a plan which is favorable as regards all of them. We must now endeavor to estimate the relative weight which the target commander in his estimate of the situation will give to each of our distinct units or groups. This must be determined from:

1. The actual tactical situation.

2. The doctrine of the enemy fleet as applicable to the present situation.

3. The known characteristics and opinions of the target commander, particularly with regard to the effectiveness of torpedoes in action.

We now arrive at two classes of tactical situations:

1. Those in which the weights assigned to the various units or groups of our forces are approximately equal and there is no outstanding unit or group to which the target commander will assign a position of primary importance.

2. Those in which there is a unit or group of our forces to which it is reasonably certain the target commander will give a primary status.

In the first case, there are two plans open to the target commander:

1. A compromise plan which will have both advantages and disadvantages as regards two or more of our units or groups.

2. A definite plan which will be distinctly advantageous to him as regards one or more of our units or groups and disadvantageous as regards the others. This opens up the possibilities of two or more plans, in each of which a different unit or group of our forces is assigned the leading status.

Therefore, in the first case, we will be unable to decide whether the enemy will adopt a compromise plan or one of a number of definite plans, and we can do no more than guess at the one which he will adopt. Under these conditions, it will be most desirable to assume that the enemy will neglect our threat and carry through the plan which will be most advantageous as regards his operations against the other units or groups of our forces. This assumption has the following advantages for us:

1. If our assumption is correct, we will succeed in putting our torpedoes through the target; if it is not correct, while the target commander will succeed in avoiding our torpedoes, he will be compelled to accept disadvantages of gun or torpedo fire, or both, as regards our other units or groups. Thus we force him to a choice of evils.

2. Furthermore, if our assumption is correct, our torpedoes will not only pass through the target, but will probably be effective against his ships, as the target commander will have taken no precautions to nullify their effect. If our assumption proves incorrect, then we have lost little, because if the enemy devotes his exclusive attention to avoiding our torpedoes, there is little chance that they will either pass through the target formation or be effective against the target ships.

3. If the target commander uses a compromise plan, not only will he suffer disadvantages as regards our other units or groups, but there is a possibility that part of our salvo will be effective.

In the second case: i.e., that in which all the evidence points to the target commander giving his primary consideration to a particular unit or group of our forces, it will be advisable to assume that he will make use of the plan which will be most favorable to him as regards that unit or group, neglecting all our other units or groups.

It is believed that these very general principles will provide a reasonably simple means of estimating the probable plan of the target commander, but each situation must be judged strictly on its merits. Having decided on the plan of the target commander, or having assumed a plan where decision would be impracticable, we must now endeavor to predict the maneuvers which he will most probably make to carry it out. Here again we must be familiar with the standard procedure of the enemy, as shown in his past actions and thus far in the present one. In case none of this information is applicable to the present tactical situation, we can only base our decision as to his most suitable maneuvers upon our general knowledge of tactics.

After having made definite decisions or assumptions as to the maneuvers which will most probably be used by the enemy, we can then determine the approximate areas which should be filled by our torpedo salvos. If we are confident of the correctness of our estimate of the enemy's intentions and are willing to gamble on it, we can put all our torpedoes in a narrow sector, so as to increase the effectiveness of our salvos, provided they pass through the enemy's line. On the other hand, if there is great doubt as to the maneuvers of the enemy, we can play a safer game and be content with a lesser effectiveness by widening the sector to be covered.

To obtain the best results from torpedo fire, all salvos fired by a single attack unit should be co-ordinated by the unit commander, who should designate the area to be covered by the torpedoes. This sector can best be defined by signaling the course and speed of the target and the spread, if any, which is to be used by the entire unit. The course and speed of the target will usually have no relation to the course and speed of the target be-

fore firing, but will be determined by the predicted maneuvers of the target during the run of the torpedoes. Should it be impracticable for the unit commander to control torpedo fire by signal, commanding officers will make their own estimate of the probable maneuvers of the enemy and fire their torpedoes accordingly. In case the approach is made behind a smoke screen, it is particularly important for the unit commander to control his torpedo fire by signal, as he will be the only one having a clear view of the situation.

It will be seen that the responsibility for the success or failure of our torpedo fire in action rests to a very great extent upon the officer who decides upon the sector to be filled with our torpedoes. It is of particular importance to have on each attack leader an officer specially trained for this duty, and an extra officer should be allowed for this purpose.

In general, the problems involved in the determination of the future maneuvers of the target may be divided into two categories:

1. The collection of information.
2. The estimate, based on this information.

Information may be collected in the following ways:

1. By advance study of the characteristics of enemy ships and of enemy tactical procedure. This is necessary for recognizing the types and classes of vessels in the enemy fleet, for determining the target angle, the maximum speed when steaming singly and in formation, the depth setting of our torpedoes, and for predicting the probable maneuvers of the enemy.

2. By viewing the situation. In this way, if visibility conditions are favorable, we may obtain an idea as to the approximate dispositions and strength of our own and enemy forces within striking distance of the target, the general course of the action, the course and speed of the target prior to firing and the target angle. Unfortunately, due to his comparatively low position on small vessels, the torpedo control officer will have a distorted picture of the action, and smoke will probably shut out at least a part of the battlefield.

3. By receiving and intercepting dispatches and signals from our own and enemy forces. It will often be possible to obtain

from other portions of our forces, particularly aircraft, valuable information as to the present dispositions of our own and enemy forces and as to the plans and projected movements of the former. There is also the possibility that we may be able to obtain information regarding the plans and projected maneuvers of the target and other enemy forces by deciphering radio dispatches and reading tactical signals. Jutland showed what could be accomplished in deciphering enemy radio dispatches, but of course this could only be done on large ships where cipher experts are available. On the other hand, there is no reason why small ships should not be able to gain information from enemy signals, particularly if the same one is made several times and the corresponding maneuver witnessed. Even the knowledge that a tactical signal is flying is important, for we have the opportunity to wait until it is executed and the maneuver completed before firing; then we will be certain that no additional maneuver will be made for the first part of the run of the torpedoes, whereas, had we fired with the signal up, such a maneuver would have been probable.

4. By plotting or using instruments graphically to solve torpedo problems. On small ships not much can be expected in the way of plotting, and consecutive ranges and bearings of certain ships should not be attempted. However, single ranges and bearings of various units of our own and the enemy forces may give the torpedo control officer a more correct idea of the situation than he can obtain by viewing it from a low position. On small vessels instruments for solving torpedo problems, notably those devised by Lieutenant Commander W. A. Lee, may be used to great advantage.

The greater part of the training of the torpedo control officer in his duty of obtaining the information upon which to base his estimate must be obtained at sea. Opportunities are constantly afforded in the routine exercises at sea and in gunnery and torpedo training. Tactical maneuvers, however, are required for giving him the necessary advanced training.

In order for the torpedo control officer to obtain the necessary information, it is evident that he should be located in a high position where he is undisturbed by other activities and from which he has all-round vision without moving. His station should be equipped with a fixed high power telescope and have voice tubes

leading to the bridge and radio room. A good range finder should be available for the use of the torpedo control party and a signalman should be assigned to it for the special duty of watching the target formation for visual signals. After having collected the information, the second part of the torpedo control officer's duty is to make the estimate of the probable maneuvers of the target formation during the run of the torpedoes.

The tactical game board affords the best training in making this estimate, for all the information is available from a study of the forces on the board and the correctness of the estimate can be determined from the future movements of the target formation and the probable number of hits which would have been made. Such training is absolutely essential for torpedo control officers.

Use could be made of the series of plates of the Battle of Jutland issued by the War College for additional training. Each of the plates of the day action should be studied in detail and the maneuvers of each unit suitable for selection as a torpedo target should be predicted for a period of eight minutes. Then by turning to the succeeding plates the accuracy of the predictions may be determined. During such a study it will become noticeable that the British battle cruisers used a doctrine of successive changes of course while the Germans used simultaneous changes. If the standard procedure of the enemy may be determined before or during an action, this will be of great assistance to the torpedo control officer in making his estimate.

The advanced training in making the estimate must be obtained in tactical maneuvers at sea. All such maneuvers should be carefully plotted and placed on the game board, together with the sectors covered by the torpedo salvos, so that the accuracy of the torpedo control officers in estimating the maneuvers of the target can be determined.

In the course of our discussion we have considered only the case of the supported co-ordinated attack. The other forms of attack will require similar estimates, but as there will be fewer forces involved, the estimate will be simpler to make. On the other hand, however, in these cases it will be more difficult to hit with torpedoes, because the more of our forces there are to engage the attention of the target commander the less attention will he be able to give to the avoidance of our torpedo fire.

It now remains only to mention the fourth requirement for successful torpedo fire: i.e., a positive and rapid system of control for firing the full volume of our torpedoes. It is evident that even though we have a perfect torpedo and know exactly how to use it in action with the most effect, we cannot obtain results unless we have the proper torpedo control equipment, which particularly includes the means of transmitting the firing orders and information to the torpedo tubes. Due to the confidential nature of this subject, its details cannot be discussed here, but all destroyer officers will know our present status in this matter and recognize the importance of having suitable torpedo control stations and equipment on the same scale as that already in use for gun control. This is of special importance for the destroyers of the attack groups of the battle fleet, where there is no question but that the torpedo should have priority over the gun and the most desirable position should be used for the torpedo control station instead of for gun control.

In conclusion, it is desired again to emphasize the following primary requirements of successful torpedo fire:

1. The development of an absolutely reliable torpedo carrying the maximum weight of explosive.
2. The study of tactics so as to determine the position and time for firing torpedoes and the methods to bring the attack units into this position at the proper time.
3. The further study of tactics to develop accuracy in the prediction of the projected maneuvers of the target in battle during the run of the torpedoes.
4. The installation of suitable torpedo control equipment in a distinct torpedo control station which will permit the torpedo control officer and party to work under the most favorable conditions in battle and have a positive and rapid system of control over the torpedo battery.

SEA SERVICE FOR NAVAL CONSTRUCTORS

By Lieutenant T. L. Schumacher (CC), U. S. Navy

Proposal

IT IS proposed that each naval constructor be required to perform at least three years of sea service as a naval constructor before he reaches the grade of captain; this service to be performed as nearly as possible in two tours of duty of one and one half years each, the first tour to be performed when near the top of the list of lieutenants and the second as a senior lieutenant commander or junior commander.

It is the writer's purpose to show: first, that the above proposal will be theoretically beneficial to the Navy; second, that this proposal is practicable of installation and operation.

Theoretical Benefits

The efficiency of the Navy, like that of any organization, depends upon three factors: first, the capacity for usefulness of the individual members; second, the opportunity the individual member is given to exercise his capacity for usefulness; third, the direction of the efforts of the individual members to a common purpose. A beneficial change in an organization generally increases one of these factors, frequently at the expense of one or both of the others. Few changes are made which increase two of these factors, yet it is believed that the present proposal will increase all three.

The capacity for usefulness of an individual member of an organization depends upon three factors: first, the individual's intelligence; second, his devotion and zeal; third, his viewpoint. That the average constructor possesses a high order of intelligence is proven by his record before he enters the Construction Corps. That he is devoted to his work and zealous in the performance of his duties has never been denied. That his viewpoint may be improved by sea service is, it is believed, susceptible to proof.

Whatever the average constructor's viewpoint is, it will be

agreed by all that it cannot be classified as "sea-going." It is submitted that the constructor should have a sea-going viewpoint for two reasons. First, it will give him first hand knowledge of the actual conditions under which the vessel he is designing, constructing, or repairing, is operated. He will, therefore, be able to perform his duties ashore with less time spent in collecting information from others. The work will be done more expeditiously and fewer mistakes will be made. Second, and more important, the constructor will develop a keen desire to satisfy the Navy afloat. Like all other individuals the constructor is confronted with two objects: to satisfy the receiver of his product and to satisfy him who pays the bill for the work. Usually the receiver of the product is the one who pays the bill. A balance between the two requirements is therefore easily attained. In the design, construction, and repair of naval vessels, however, the Navy afloat, represented by the ship's officers, is the receiver of the product; the taxpayer, represented by those in Washington, pays the bill. That there should be no conflict between the demands of the two is admitted; that a conflict does exist is easily proven. Ask any ship's company for an opinion of a particular navy yard. The answer will be based entirely upon the amount of satisfactory work obtained from that yard during the last visit. Never a word will be said of the costs involved. Then review the appropriation bills passed by Congress. Few there are of us who cannot recall from his personal experience cases where the demand for economy has totally eclipsed all consideration of efficient operation. Answerable as the constructor is to both the Navy afloat and the taxpayer ashore, his viewpoint is necessarily influenced by his contact with either of the two factors. Sea service will, it is believed, improve the constructor's viewpoint by better balancing the development of his interest in the costs and his desire to satisfy the ship's officers.

It is believed that the present proposal will increase the constructor's opportunity to exercise his capacity for usefulness. The value of a battleship is, in the last analysis, gauged by its efficiency in battle. This efficiency is determined by two factors: first, preparation; second, execution. An officer's opportunity for exercising his capacity for usefulness afloat is gauged by

his opportunity to increase the efficiency of the vessel on which he is serving.

Within the scope of preparation comes the preservation and repair of the vessel itself, which is chiefly a matter of technical knowledge exercised with a proper appreciation of expenditures. This duty would unquestionably present to the constructor a great opportunity to exercise his technical knowledge and his keen appreciation of costs. The vessel would be kept in better condition with less expenditure of funds and time through this utilization of the constructor's capacity for usefulness.

Within the scope of execution comes the managing of the vessel in action so as to permit the proper utilization of her offensive powers. The writer has, in a previous article, attempted to show that, if a vessel is to retain her offensive power after an under-water attack (mine, aerial bomb, or torpedo), special steps must be taken to keep her afloat and seaworthy. It was pointed out that an under-water explosion will nearly always produce a list and that this list may render the vessel helpless against the enemy. If the vessel is to continue the battle, counter-flooding must be quickly and properly effected. This requires a thorough working knowledge of the theory and practice of subdivision, of buoyancy, stability, the effects of free water surface, moments, and stresses as well as complete familiarity with the details of ship construction, counter-flooding systems, and compartments on that particular vessel. Surely, in such a time of battle the constructor will find opportunity to exercise to its fullest extent his capacity for usefulness. Surely there are few others who could take his place. Would not the saving of one battleship in time of battle pay for many years of constructor sea service.

It is believed that the most extensive, as well as the most immediate benefit of sea service for the constructor, is that it would increase the Navy's ability to direct the efforts of its individual members to a common purpose, that is, increase co-operation. Much has been said lately of "amalgamation." It is submitted that the only amalgamation necessary, indeed the only amalgamation desirable, is amalgamation of interests. And what expresses a closer bond of interest than the word "shipmate." Send the constructor to sea; let him renew with the officers of the line his former friendships and make new ones at the ward-room

mess table, and much of the petty misunderstanding and jealousy, which daily take their toll of time wasted and energy misspent, will disappear. Just as the Line-Construction Corps controversy now opens the way to so many Line-Staff differences, so will the Line-Construction Corps entente lead the way to a more complete co-operation than could be obtained by any amalgamation of duties, education, or promotion. The Construction Corps is the only staff corps normally recruited from Naval Academy graduates. It is, with exception of the Civil Engineer Corps, the only staff corps whose members do not regularly perform sea service. Would it not be a great step toward complete co-operation to amalgamate the interests of the Line and Construction Corps, whose members are basically related but now somewhat estranged in interest by the diversity of duties performed?

Practicability

Before entering into a discussion of the practicability of the present proposal, let it be noted that "practicability" is a relative factor; that is, it is measured relative to the theoretical benefits. A measure is said to be practicable or impracticable depending on whether or not the theoretical benefits are believed to be worth the expense of putting the measure into operation and maintaining it. Let it also be noted that the present proposal offers theoretical benefits to the naval organization in three distinct ways. The aggregate of these benefits will be a quantity of no mean proportions.

The expense of putting into operation and maintaining the present proposal is gauged by the amount of reorganization necessary, that is, can the constructor be fitted into the present organization afloat and can his place in the organization ashore be filled in his absence. Briefly stated, the question is one of supply and demand. Let us first consider the question of fitting the constructor into the organization afloat. There are at present twelve constructors doing duty afloat. There are eighteen battleships in commission and there will shortly be two additional airplane carriers. It is suggested that the first lietuenant's billet on each of these vessels be filled by a constructor. This will make, all told, thirty-two positions for constructors afloat, assuming that

the twelve positions now filled by constructors would continue to be so filled.

The only change in the present organization would be to have constructors instead of line officers perform the duties of first lieutenant on the capital ships. This suggestion is neither original nor radical. The writer has heard it voiced by line officers many times.

Theory to the contrary, the first lieutenant's job is now generally regarded as that of a super-dirt-chaser. The duty of the maintenance and repair of the hull has fallen almost entirely upon the ship's carpenter. This condition obtains because the line officer is not properly educated for the work involved. Lack of knowledge means insufficiently developed interest. The constructor has the education and experience for the work. His intense interest in it is therefore assured. This will result in reduced repair bills and better maintenance of the hull.

It has been pointed out above that in the naval war of the future the efficiency of the Navy afloat will be largely influenced by the ability of the ship to stand up under an under-water attack. Only the constructor, acting as first lieutenant, with his specialized knowledge and training can insure this factor.

The above statements are not made as a criticism of the line officer, but rather as a statement of fact which, it is believed, will be agreed to by those who give the subject a moment's unbiased thought.

The present constructor, on the first tour afloat, would be deficient in his knowledge of the ways of the sea. This would detract from his value to the ship, but he could be relied upon to make up this deficiency in a very short time.

The constructor would not be available for command. This would reduce the number of those available for duty as commanding officer when the ship is in port. It is suggested that the senior watch officer could be utilized to make up this vacancy.

It would probably be necessary to assign constructors to vessels whose executive officer is junior to the constructor. On other vessels, the constructor might be junior to the senior watch officer. This should present no difficulty. Staff officers of other corps are now doing duty afloat under these same conditions.

Let us now consider the supply of constructors for duty afloat;

that is, whether the number of constructors is sufficient to fill the vacancies afloat and whether the removal of the required number of constructors from the shore establishment would hinder its operation.

According to the latest figures available, there are now 175 constructors with the rank of commander, lieutenant commander, and lieutenant. The average length of time spent in these three grades is about twenty years. With thirty-two positions afloat there would be a demand for thirty-two times twenty or 640 years of constructor sea service to be performed within this period. This would require that each constructor spend a little more than three and one half years at sea. This is very consistent with the proposal which requires that the constructor perform not less than three years of sea service.

Thirty-two constructors of the rank of commander, lieutenant commander and lieutenant would be performing sea service. Twelve are at present so detailed, which means that twenty more would be taken from duty ashore. It is believed that under the present conditions as regards the building of new vessels and navy yard organization these twenty vacancies could be filled with the line officers who would be relieved of the duties of first lieutenant afloat.

Sea service for constructors with the rank of captain is not suggested for three reasons. First, captains would have benefitted from the service at sea in the lower ranks. Second, a captain's experience and knowledge would be far better utilized ashore than afloat. Third, no positions afloat commensurate with the rank of captain are available for constructors.

Sea service for constructors with the rank of junior lieutenant is not suggested for three reasons. First, the young constructor must acquire knowledge and experience in his specialty. This requires that his time be spent ashore. Second, the young constructor would not be qualified to hold the important position available at sea. Third, he has, but a few years before, performed service at sea.

It is realized, of course, that the present proposal cannot be put into full operation at once. The establishment of the three-year sea service requirement will have to be attained, gradually requiring only a proportionate amount of such service of those

constructors who have already partially attained the rank of captain. It is also appreciated that the above plan is not developed in complete detail. The details can only be worked out by one thoroughly familiar with the question of personnel and duty assignments. Even then much would have to be left unsettled due to unforeseen changes in the personnel situation. It is believed, however, that it has been shown there are not insurmountable obstacles to sending constructors to sea and that the benefits received would be well worth their cost.

Conclusion

It has been suggested that constructors with the ranks of commander, lieutenant commander, and lieutenant, be given sea service of at least three years, to perform this duty as first lieutenants on capital ships, on fleet staffs, repair ships, and airplane carriers. It has been shown that such a policy would improve the individual constructor, would increase the efficiency of the vessel on which the constructor is stationed, and would result in increased co-operation in the Navy. Further, a definite plan has been outlined to show that there are no insurmountable difficulties in adopting this policy. Why not send the constructor to sea?

THE WRECK OF THE U. S. S. TACOMA

By Lieutenant W. A. Sullivan (CC), U. S. Navy

ON THE morning of January 18, the U. S. S. *Prometheus* completed the canal passage and dropped anchor in the harbor of Colon, Canal Zone. The battle fleet was assembled there for the maneuvers. Overhead planes were hovering to and fro, and somewhere off the coast the scouting fleet, the attacking force, was endeavoring to come unseen within the range of the Colon defenses. At noon there came a rumor that the enemy had been sighted and the evolutions completed. Many eyes were turned toward the flagship waiting for the expected signal which, terminating the maneuvers, would announce the commencement of liberty.

Soon a signal was wigwagged, but it was not the expected one. It was an order to prepare at once for detached service and for the commanding officer to come on board the flagship for instructions. Liberty cards were returned to the general office, boats were rigged in, deck gear stowed away, all loose equipage lashed up, and with the return of the commanding officer, the anchor was hoisted simultaneously with the taking in of the gig. Within an hour after receiving the signal the *Prometheus* was steaming past the battleships of the fleet and out of the breakwater entrance. We were bound for Mexico to the relief of the U. S. S. *Tacoma,* stranded on Blanquilla Reef, outside the harbor of Vera Cruz.

On the trip across the Caribbean the ship struck a heavy "norther" which lasted a couple of days. On the day after it abated a radio was received announcing the sinking of the *Tacoma* in this gale to her gun deck level. Subsequent radios announced the death of Captain Herbert G. Sparrow, the commanding officer of the *Tacoma,* and ordered the *Prometheus* to proceed to Tampico to meet the U. S. S. *Richmond* at that place.

On the afternoon of January 24 the *Prometheus* arrived at Tampico where 236 survivors of the *Tacoma* were transferred

from the *Richmond*. The night was spent in fueling and in the morning the *Prometheus* departed for Vera Cruz where she arrived on the morning of the twenty-seventh.

Upon approaching Vera Cruz the wreck of the *Tacoma* could be seen off the starboard bow and as the *Prometheus* slowed down for the pilot boat, a motor sailer was launched and a wrecking party sent to destroy all ordnance left on the stranded ship.

Blanquilla Reef, a long, narrow bank of coral, famous for its disasters, is one of the series of reefs which encircle the entrance to the harbor of Vera Cruz. In very calm weather the crest

Chf. Carp., N. A. Nightingale, U. S. N.

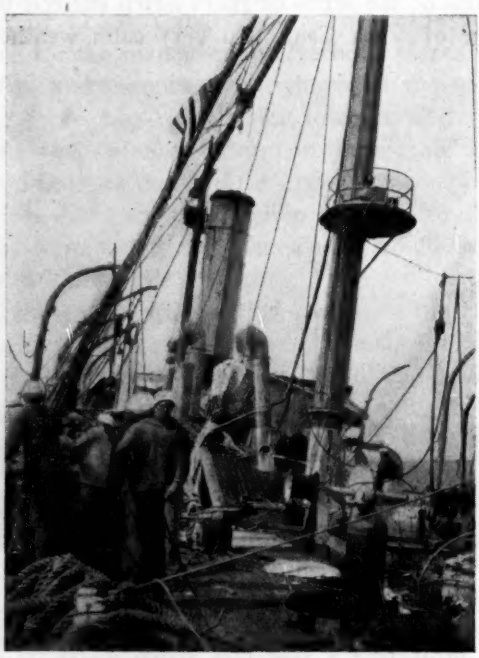
VIEW OF STARBOARD SIDE OF "TACOMA"

of the reef, projecting a few feet above water, is about sixty feet in width. In time of storm the breakers sweep across the entire width of the reef. It has at one place a small steel framework supporting a light.

The wrecking party found the *Tacoma* lying parallel to the crest of the reef and about fifty feet away. She had a list to starboard and was in about seventeen feet of water. An idea of the damage the ship had sustained could be formed on approaching. Both of her topmasts were gone, as well as the number two smoke stack, the radio house, and her boats. The bridge was wrecked, and the crow's nest on the foremast, badly battered and

hanging from its brackets, testified to the heights attained by the waves. The starboard shell plating from amidships aft could be seen badly stove in. All the gun port shutters on this side were gone and her main deck was covered with a mass of wreckage.

The *Tacoma,* lying parallel to the reef, formed a sort of breakwater and made an otherwise hazardous boarding possible. Upon boarding her, the damage found was astounding. The number two stack, seen missing upon approaching the ship, was gone



Chf. Carp., N. A. Nightingale, U. S. N.

MAIN DECK OF "TACOMA"

entirely. Its wreckage could be seen in the clear water between the ship and the reef. The flat cowls of those ventilators which remained had been crushed by the seas. Many of the steel covers to the water-tight hatches were gone and the starboard side of the hatch combings deformed. The bridge was wrecked and the navigational instruments had disappeared. Only ragged holes or ripped planking in that part of the bridge deck which remained, testified to their existence. One rapid fire gun from the star-

board side was found on the main deck amidships and a damaged hammock netting on the port side showed the force with which the gun had been thrown across the ship. Parts of the engine and a twisted propeller of a thirty-six-foot motor sailer were found strewn about the deck. Nothing remained in the port skids, where this boat had been stowed, while in the starboard skids there was the engine of a gig, the keel, the stem, and some broken, twisted planking. A three-inch field piece, caught in fallen wreckage, was hanging over the side, only a few fragments of its wheels and carriage left. Everywhere on the main deck was wreckage and the evidence of fearful destruction.

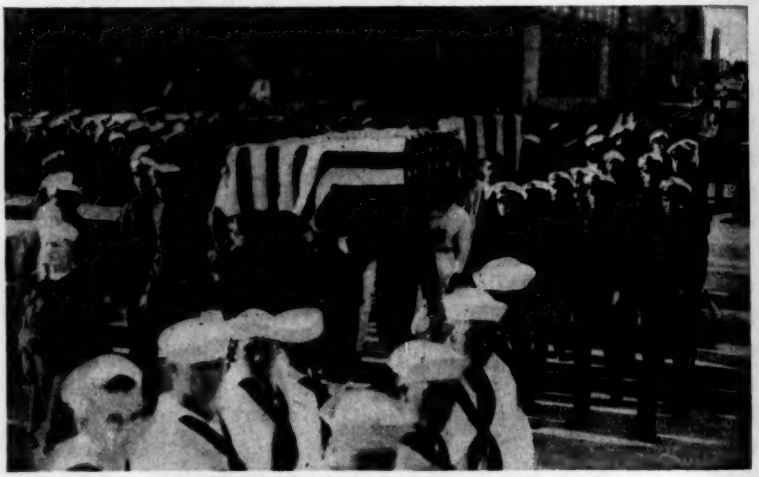
Below, the damage was even worse. The water level was just below the gun deck and through the missing gun port shutters the waves were still rolling in. The side plating, torn just above the gun deck edge, allowed the water to escape with the retreat of each wave. The entire starboard side amidships and both sides aft on the gun deck were bare. Nothing remained except stanchions and some of the water-tight bulkheads. The corrugated iron partitions were gone, as was everything of wood. Of the furniture in the captain's quarters, scarcely anything remained and that only in fragments. Things had simply disintegrated. Not a back nor a leg remained on a chair nor a rung attached to a leg. Water-tight doors had been ripped from the hinges, dogs stripped from the bolts, air port frames torn from the shell plating.

Many of the personal effects of the captain, his medals, the metal of his golf clubs, his battered table silver, shoes, and a number of his chessmen together with pieces of broken tile, tattered remnants of clothing, scraps of wood and other articles too disfigured to be recognized, were found behind the sheathing on the starboard side. The water, seeking to escape through the broken shell plating, had carried the debris with it and piled it up behind the sheathing. The decks were bare of linoleum and the captain's bath of tile. This tile had been the cause of much of the apparent disintegration, as it was found throughout the ship, and evidently carried about by the surging sea, had acted as so much abrasive.

Only on the port side abreast the machinery casings and in the sick bay immediately forward were things more or less intact, but even here there was considerable damage and evidence of the

fury of the storm. The deck itself at one point had opened up in a transverse rupture, extending from the engine room bulkhead to the shell plating. As it was afterwards learned, it was at this place that the officers and men on board during the second storm had taken refuge.

The hatches leading below decks were filled with twisted steel ladders and broken furniture. The constant commotion of water with the attendant crashing about of the debris rendered any attempt to go below the gun deck extremely perilous. Attempts made on the following day by divers from the *Omaha* and the



Chf. Carp., N. A. Nightingale, U. S. N.

MEXICAN NAVAL GUARD DELIVERS BODY OF CAPTAIN SPARROW TO AMERICAN BLUEJACKETS

Prometheus to gain the magazines were given up on this account; hence little knowledge of the condition of the hull below the water level could be ascertained. Looking down the engine-room hatch, the port engine seemed to be listed somewhat to port. This condition could not be definitely determined, as here, too, the water was in a state of turbulence and was full of floating wreckage.

It was found that the breech plugs of the guns had already been removed from the ship and the wrecking party completed the destruction, cutting slugs from the gun barrels and sections through the gun mounts with the oxy-acetylene torch. Nothing on the ship was found to be worth salvaging except the mirror

of the searchlight mounted above the bridge. The searchlight itself was battered out of shape but, strangely, the mirror escaped unscathed.

Returning to the *Prometheus,* the wrecking party found the ship inside the breakwater, with the U. S. S. *Omaha,* and three destroyers. The *Omaha* was flying the flag of Rear Admiral Kittelle, commander destroyer squadron. Preparations had already been made for the reception of the bodies of Captain Sparrow, U. S. Navy, and Solomon Sivins, radioman third class. The bodies were lying in state ashore at the Naval College, then held by the De La Huerta forces. A boat party made up from the United States ships present received the bodies at the dock to which they had been borne by a guard of honor from the Mexican rebel forces. They were turned over with fitting ceremonies. Everywhere marked respect for the dead was shown. Thousands of the citizens of Vera Cruz lined the docks, the *Omaha's* band played the funeral hymns, and her airplane flying overhead dropped flowers on the water. When the bodies were lowered to the *Prometheus* motor sailer not a head was to be seen, of the thousands present, that was not uncovered.

On the following day, the remaining survivors of the *Tacoma,* several of whom were severely injured and almost all of whom were suffering from privation and exposure, were transferred to the *Prometheus* from the *Omaha,* and that afternoon the ship sailed for Charleston, S. C.

* * * *

The following account of the grounding and subsequent wrecking of the *Tacoma* has been compiled from the stories of the survivors.

In the early morning of January 16, the U. S. S. *Tacoma,* Captain Herbert G. Sparrow, U. S. N., commanding, while attempting to make the entrance to the harbor of Vera Cruz, ran aground on Blanquilla Reef. The general alarm was sounded and the engines were reversed at full speed. The ship was found to be hard and fast on the reef, forty-five minutes of continuously reversing at full power failing to net any result. The condensers became hot; sand was evidently entering the intakes. The engines were stopped and all hands combined to shift astern ammunition and other movable weights, in an effort to lighten the bow.

In the meantime the storm, which had been threatening, had commenced to break, and at seven o'clock waves were tumbling over the side. The *Tacoma,* which had originally struck bow on, was now swung by the force of the seas broadside on the reef. Water was reported rising rapidly in the after fire room and orders were given to secure the boilers and vacate that compartment. Soon the other fire room and the engine rooms were abandoned for the same reason. The radio in the meanwhile, was busy sending out "S.O.S." calls, and on deck every available man was being used in the construction of life rafts.

The dinghy was lowered over the side and a line was run to the light on the reef, in case the use of the breeches buoy became necessary. The men in the dinghy were unable to return to the ship and a whaleboat was sent in with a second line. The crew of the dinghy was picked up and the whaleboat, in attempting to return to the ship, was upended. After a two-hour battle with the seas the last of the men succeeded in making the light on the reef, with the exception of one who swam to the ship.

Meanwhile a small harbor tug and the steamship *Yore* were unsuccessfully attempting to float a line to the stranded vessel, but with the approach of night and the increasing storm, the vessels sought refuge within the harbor. A Mexican gunboat flying the colors of the De La Huerta forces came out and rescued the men on the light, after which it stood by, throughout the storm, in the lee of the reef.

On the *Tacoma,* the waves were breaking all over the ship, water leaking in through the hatches and gunports. The shutter at No. 5 gun, aft on the starboard side, carried away, flooding the adjacent compartment. The other gunports, leaking badly, were caulked with sea bags.

With the coming of morning the storm abated and at 10:00 A.M. the American consul came on board for a conference with the commanding officer. It was decided to take most of the men off and in the afternoon the Mexican gunboat took off all but Captain Sparrow, seven officers, and forty-two men. The gunboat transferred these men to shore where they were given quarters in a dance hall at a beach resort, five miles north of Vera Cruz and directly opposite Blanquilla Reef.

The men remaining on board commenced to clear up the wreck-

age, replaced the shutters, secured additional braces at the No. 5 gunport, and made preliminary preparations for the work of salvaging the ship. On the eighteenth the *Tacoma* took a slight list to starboard.

On the nineteenth the U. S. S. *Richmond* arrived from Panama and the U. S. naval tug *Bayspring* from New Orleans. On the twentieth the U. S. S. *Allegheny* arrived and the *Richmond* left for Tampico, taking with her the men quartered on shore with the exception of twenty, left with the tugs for armed guard duty.

Word was received that another storm was coming, but as the *Tacoma* had successfully weathered one, which had been quite severe, the commanding officer felt that she would have no difficulty in going through another. Every effort was made in the meantime to get the *Tacoma* off the reef. The tugs ran lines to the ship and made several attempts to drag the vessel off. These were unsuccessful as the lines were all too light and parted under the strain.

Shortly before the storm commenced the wrecking tug *St. Helena* arrived and ran a fifteen-inch hawser from the stern to a wrecking anchor placed to seaward of the ship. At 2:30 P.M. the storm broke, just as the crew of the *Tacoma* were endeavoring to take in the slack on the hawser. For two hours they exerted every ounce of strength, Captain Sparrow, the officers, and seamen alike bearing a hand. It was hoped that by keeping a strain on the hawser the ship's stern at least, as it was oscillated up and down by the heavy sea, might be worked off the reef. The storm gathered quickly; soon the fury of it far surpassed the earlier one and it was impossible to remain on deck. The men retreated below, closing all but one of the water-tight hatches on the topside.

Below, the gunports were leaking and again attempts were made to caulk them with bags and reinforce them with additional shores. The storm, increasing to the violence of a hurricane, rocked the ship incessantly on the reef. Water was rising in the compartments below, the berth deck was vacated and all hatches leading below the gun deck were closed. The hatches aft leading to the topside began to leak; a shutter to one of the starboard guns gave way, letting in a rush of water. Lieutenant Fitzpatrick, the navigator, with several men, was endeavoring to add extra

shores to this shutter, when it gave way entirely, knocking down Lieutenant Fitzpatrick, breaking his collarbone, and knocking Regan, boatswain's mate first class, unconscious; Owens, ship's cook, and Sivins, radioman, received minor injuries.

The captain, wishing to see the condition of the topside and to get into radio communication with the shore, went above through the forward hatch, taking with him Lieutenant Hungerford and five radio men. Shortly after he left, a huge mass of water came over the forecastle and, pouring through this hatch, carried away the ladders, thus destroying the last means of communication with the topside. Other gunport shutters were giving away, the gun deck compartments were being swept with large volumes of water and those below retreated to the only place of refuge remaining, the compartment on the port side abreast the machinery spaces. They closed the water-tight doors to this compartment, and used everything at hand to reinforce the doors and shore the bulkheads.

The pounding of the ship increased, waves lifting her up and dropping her on the hard coral of the reef. The uproar of the elements made sleep or rest impossible and every minute it was thought the ship would break up or roll over. Soon water was leaking into the compartment of refuge. Higher and higher it rose, forcing the occupants to seek safety on mess benches and on the tops of clothes lockers. There the night of peril was passed.

In the morning, during a lull in the tempest, Sill, signalman third class, succeeding in making his way to the upper deck, found in a hammock netting Lieutenant Hungerford and Chief Radioman Cooper, both semiconscious and seemingly at the end of their physical powers. The former was feebly calling for the captain, and in an adjacent netting Sill found the bodies of two radio men, Sivins and Lussier, the bodies being horribly crushed. Nothing could be seen of the captain or of Herrick, the other radioman. Waves were tumbling over the side and masses of water sweeping the deck carried destruction and potential death from bow to stern. The injured were taken through a bunker plate; the lull in the storm being over, it was absolutely impossible to remain on deck. The bunker plate was replaced and again all exits to the topside were barricaded.

Food had now given out, the men were living on emergency rations and scraps of floating bread. If the storm did not abate

soon, the end was only a question of hours. The prisoners of the elements, skin bruised from floating coral, injured by drifting wreckage, watersoaked, nerve racked, famished and some suffering greatly from thirst, were nearing the end of their resistance.

Lieutenant Hungerford revived enough to tell the story of the topside. Finding the radio house gone and unable to make their way back to the hatch, the party sought refuge in the hammock nettings. This was a poor shelter at best, but it was the only retreat possible. The heavy steel top and sides protected them from falling masts and rigging, and from wave-borne wreckage, but the waves surging across the deck repeatedly swamped the nettings and threatened to drown them within the enclosure. Constant vigilance was needed to keep their heads above water and to brace themselves for the shock of the successive water attacks. Their strength was rapidly giving out. Then the gun on the starboard side carried away, and tossed by the infuriated water here and there about the deck, threatened to crush the side of the hammock netting. It was decided to attempt a retreat to another netting and a dash was made. Hungerford found himself in another netting with Cooper but saw nothing more of the captain. About that time the stack went down, taking with it a lot of adjacent topside hamper.

Fortunately the severity of the storm during the second night was not as intense as that of the preceding, and in the morning it had calmed considerably. Again the topside was gained and this time it was possible to make a more thorough search. The body of the captain was found under some vegetable lockers on the starboard side in the vicinity of the missing stack. The bodies of Sivins and Lussier were gone from the hammock netting; that of Sivins was later found with the head sticking in an ammunition hoist. No traces could be found of the other two.

The storm continued moderating and later in the day a whaleboat was launched from the *Allegheny*, which succeeded in making five trips to the *Tacoma* taking off all but sixteen of the men. These sixteen, including two of the injured, were taken off by a Mexican pilot boat which was capsized just after leaving the *Tacoma*. Fortunately all on board were cast up on the reef where they found refuge on the light tower.

Words cannot adequately express the devotion of the survivors

to the memory of their late captain. One and all were filled with sorrow for his loss and with the greatest admiration for his conduct throughout the crisis. Up to the very end he exhibited the most sterling qualities of leadership. Wherever the breach was, he was foremost; never ordering, but leading; without fear for himself, he was all for the ship and for the safety of his men. He died an example for us to heed.

This story would not be complete without a word, too, for the generous Mexicans in De La Huerta's forces. Everything possible, within their limited resources, was done for the rescue and relief of the *Tacoma* and her personnel.

PREPARING AN ADVANCE BASE

By Lieutenant F. H. Gilmer, U. S. Navy

Foreword.—A fleet arrives at an advance base. In short order water barges are alongside, boats shove off and land a liberty party at a rather elaborate landing. The party proceeds to spend money at a well stocked canteen and to play ball upon an excellent diamond. When the party returns to the ship it is permitted to watch a motion picture show—which even at that moment is being exhibited on Broadway.

It is all so very simple that we are apt to take things for granted. Of course the ranking officers are cognizant of what has been done, for their correspondence has fairly bristled with information, but unfortunately we are not all ranking officers. To be sure we could read the hundred page report concerning things, but official reports are apt to be dry and for that reason we forego the opportunity to increase our store of knowledge.

But the preparation of an advance base is an interesting task. It makes a story worth telling—let us proceed with the tale.

The Island Which Served as an Advance Base.—The island selected was one of a group of semi-tropical islands. It was six miles in length and had a greatest breadth of three miles. Hills predominated and but few level spots of any size were to be found. Most of the island was covered by a thick growth of cactus and other tropical vegetation of an impassable nature. The northern shore, bald and steep, was indented by numerous beautiful but treacherous bays. A large bay on the eastern coast with a narrow twisting entrance channel afforded an excellent anchorage for aircraft and safe swimming for the personnel.

Cattle grazing was the major occupation of the natives. Prior to the arrival of the fleet it was necessary temporarily to transfer more than a thousand head of cattle to an adjacent island.

Most of the island's population of 1,200 was quartered in two small towns. A single modern building merely added, by contrast, to the dilapidated appearance of the native dwellings.

When news of the contemplated occupation of the island was broadcast, hundreds of small merchants and bumboatmen descended upon this hitherto unknown spot and more than doubled its population.

One man owned most of the desirable land. This was leased from him by the Government for the period covered by the occupation.

Preliminary Preparations.—A capable officer, with the rank of lieutenant, was selected to take command of the "advance party,"

AVIATION FIELD AND INNER HARBOR

the selection of this particular man being based on several years' experience in command of small craft. A retired naval officer, living upon an adjacent island, was recalled to active duty. His work as a liaison officer proved invaluable.

Steps were taken to accumulate and absorb all of the information resulting from a similar occupation of the island twenty years ago, and from the infrequent visits of naval vessels to that place within recent years. A recent graduate of the paymaster's school was ordered to assemble the equipment and supplies for the use of the advance party and the establishment of a canteen. A cargo vessel was assigned to transport the thousands of tons of

equipment essential to the establishment of a marine camp; and a transport was detailed to bring the first contingent of 1,700 marines to the island. Two additional vessels, mine sweepers, with a combined complement of ten officers and 150 men, were designated for the advance party.

The advance party sailed from the United States two weeks prior to the departure of the fleet—maneuvers of the fleet gave them six weeks in which to make all preparations. Enroute, the wireless telephone was frequently used. It permitted the officer-in-charge to confer with his assistants aboard other vessels and facilitated preparations to a marked degree.

Tragedy and Heroism.—The arrival of the advance party was saddened by the death of one of its members. Four enlisted men went swimming in one of the bays on the northern shore. Apparently none of these men was cognizant of the danger of an undertow, always found on a surf beaten beach, and only one man was a capable swimmer. The entire party soon found themselves battling for life against the elements. The lone swimmer, risking his life time after time, saved two of his comrades and made a heroic but futile attempt to save the third.

The Water Question.—The solution of the water problem was one of the largest tasks confronting the advance party. The island was to be occupied during the dry season and the only local source of supply was rain water caught upon a water shed and stored in five cisterns. When in the best of condition this system was inadequate to meet the demands of a fleet. The water shed and cisterns had deteriorated with the passing years and it was necessary for the advance party to make many repairs. Most of the piping had so corroded as to make renewal essential. To augment the source of supply one self-propelled water barge with a capacity of 100,000 gallons was brought from a naval station 700 miles away; and another barge of equal capacity, but non-propelled, was towed from a second naval station 800 miles distant. To insure a factor of safety a navy standard 500-ton coal barge was converted into a water barge with a capacity of nearly 200,000 gallons.

Ample water was available at a small sugar manufacturing town upon an adjacent island, twenty-two miles from the advance base. To permit the expeditious filling of the water barges, it was necessary to lay 500 feet of three-inch pipe from the city

mains to the end of the dock. Valuable assistance was rendered by the transportation engineer of the local sugar central. He secured and supervised the work of fifty laborers, making it possible to complete this task in the remarkably short time of six hours.

After one trip the non-propelled water barge was secured to a dock at the advance base. Pipe lines were layed to supply the various activities ashore and a steam pump delivered 25,000 gallons of water each day to the personnel quartered on land. When a rain of unusual and unlooked for intensity damaged the shore stowage system the converted coal barge was utilized as a reservoir and saved the situation.

The sudden increase of the inhabitants of the town resulted in a shortage of water among the natives. The Navy came to the rescue with 100,000 gallons for local consumption.

The base was occupied for about three months by a force varying in strength from 2,000 to more than 50,000. During that time nearly 4,000,000 gallons of water were supplied by these barges. One half of that amount was consumed by shore activities; the other half was delivered to vessels of the naval force.

Other Activities of the Advance Party.—It was necessary to build boat landings. Two were built in the inner harbor, one at the town and one close to the site selected for the fleet canteen camp. Seven were built in the outer harbor. Those landings were supported by piling. A pile driver was secured from a near-by American possession. It was the original intention to augment these landings by the use of floats made of Carlin life rafts but a lack of buoyancy on the part of the floats prevented this. Some of the life rafts were utilized for swimming floats.

A level tract of land having a length of 1,700 feet and a width of 500 feet was selected as an aviation landing field. Ninety natives were employed to clear away the undergrowth and fill in the depressions. Seven baseball diamonds, with portable back stops, were laid out upon this field. In the vicinity of the field was erected a boxing platform and three grand stands to accommodate the spectators. To give added safety to the landing of planes, a mangrove growth, extending from the edge of the field to the water, a distance of 400 feet, was cleared away.

A canteen camp consisting of storehouse, mess hall, canteen, ice house, galley and latrines was erected. An officers' club, with

two adjoining tennis courts and a motion picture exchange, was constructed by the advance party.

This represents only a small portion of the effort expended by the advance party; the tale of their accomplishment is interwoven with all the other activities incidental to the occupation of the base.

The Arrival of the First Contingent of Marines and the Equipment.—The first vessel to arrive was the transport with 1,200 enlisted personnel, 150 officers, and a small part of the equipment. Disembarking commenced immediately upon the anchoring of the transport and was completed in less than twenty-four hours. The self-propelled water barge was utilized to tow lighters, laden with equipment, from the transport to the dock.

Two hours after the arrival of the transport the cargo vessel arrived and was moored fore and aft close to the landing. In less than two hours the marines had built a pontoon bridge leading from the dock to the ship. The first of the cargo to be discharged was the motor trucks. After being shoved ashore their tanks were filled with gasoline and they were then utilized in the transportation of material from the ship's holds to its new location on land. A lighter was used to take cargo from the off-shore side of the vessel. The lighter was so trimmed that when loaded its deck was flush with the sea wall. Each load was towed from the ship's side to the sea wall and was then discharged without any additional lifting.

The Marine Camp.—In short order the ground was cleared away, tents were erected, galleys were established, planes were assembled and put in the air, several miles of road were built, guns were assembled and put in position to defend the island, more than a hundred miles of telephone wire were strung, permitting communication between the many places occupied, and an observation balloon floated lazily but alert high over this new city of nearly 2,000 souls.

As no fuel was available upon the base for cooking purposes, the advance party secured and transported from an adjacent island more than 400 tons of wood. This had to be purchased at the rather exorbitant price of nine dollars a ton. The arrival of the fleet put an end to this, for the boxes made available by those vessels proved to be a more than adequate supply.

A portable filtration plant purified all of the water used for cooking and drinking purposes. Stagnant water of unsavory odor entered the plant to come forth as water of crystal clearness and absolute purity. Some of the more distant camps were not served by water mains. Small waters wagons were filled from a stand pipe erected on the edge of the aviation field and hauled by tractors or trucks to those camps.

Horses, always essential to a landing force, were purchased on an adjacent island and transported by tugs to the occupied land.

A few weeks later the second contingent of marines arrived. It was equal in strength to the first. After a forced landing in which beetle boats, machine guns and gas were used, they established a camp similar to that previously described.

The Departure of the Marines.—A transport stood into the harbor at seven in the morning. Prior to its arrival all of the equipment had been loaded upon the decks of water barges, coal barges, and lighters. Fifteen minutes after the transport dropped anchor the fleet of small craft was alongside and loading was started. The eight small boats of the transport were lowered and in less than two and one half hours every pound of equipment assigned to that vessel, and every one of the 1,700 men were aboard. The small city had disappeared as rapidly as it had appeared. The loading of the cargo vessel had been expeditiously completed in three days.

The Fleet Canteen.—One month prior to the departure of the fleet canteen party for the advance base the lieutenant in charge and his assistant began to assemble the material essential to the erection and the proper functioning of the canteen. Tents and mosquito bars were borrowed from the marines. Steel cots were procured from the operating base. Lumber, roofing paper, wire screen and nails were purchased. Contracts were let for cigars, cigarettes, candy, cakes and soft drinks. In all, a little less than 100 tons of material was assembled and shipped aboard the same cargo vessel that brought the marine equipment to the base.

It was decided that a flag should fly over the camp. The flag staff was very wobbly and fairly high but the youngster selected to reeve the halyards did not seem particularly annoyed by that. He climbed the pole with all the agility of a monkey. Little wonder—but a few months before he had substantiated his name,

"The Human Fly," by scaling the first twenty-one stories of the Woolworth Building!

When the erection of the camp was completed and the storehouse had been stocked the personnel was reduced to approximately sixty men. The sale of 75,000 bottles of soft drinks, 35,000 packages of cigarettes, 30,000 cigars, and $15,000 worth of candy is testimony to the fact that these men were not idle. The sales amounted to about $400 a day—this in spite of the fact that maneuvers, recreation periods, and rain resulted in many days going by with practically no sales at all.

The Motion Picture Exchange and other Activities.—The motion picture exchange was located in a spacious building near the dock. This greatly facilitated the matter of circulation and proved much more efficient than retaining the exchange aboard ship. Five men were employed in the exchange; one chief petty officer in charge, another for the inspection and repair of motion picture projectors, and two petty officers to inspect, rewind, and issue programs. For the entertainment of the naval personnel during the occupation of the advance base, 250 of the most recent motion picture productions were purchased. When a film had completed circulation in the fleet it was shipped to some other naval activity. Hundreds of transfers eventually resulted in its being shown aboard naval vessels or at naval stations all over the world. The daily issue of this exchange, which served but one half of the fleet, was fifty programs.

The officers' club permitted conferences of two hundred or more officers to discuss various naval activities incidental to winter maneuvers.

A signal station established ashore facilitated communications between vessels lying in the open roadstead and those at anchor within the harbor.

A guard mail station located in the motion picture building expedited the handling of official correspondence.

A weekly trip made by tug, insured satisfactory delivery of the fleet's mail.

One bit of work done by the advance party, devoid of financial return but certainly worth the effort, was the renovation of a long neglected cemetery occupied by the bodies of one officer and six men.

Range Finder Calibration Beacons.—A party of three officers and three men from the train were assigned the duty of surveying for and erecting beacons to facilitate the calibration of range finders used aboard the fighting units of the fleet. Several days were spent in relocating center marks established long ago by previous surveys. Frequently these marks were located on high hills made almost inaccessible by thick undergrowth and a dozen different varieties of cactus. After this task had been accomplished it was necessary to transport the material for the beacons, three of which were steel towers fifty feet in length, in small boats to the beach, manhandle it to the top of these hills or bluffs, and erect the beacons. A careful survey showed that all towers were within one yard of their proper positions and that the major beacons were at distances of 3,000, 5,000 and 20,000 yards from the central point. At the same time all newly established buoys and lights were located by triangulation.

The Sanitary Side of the Expedition.—A medical officer accompanied the advance party. He cared for the sick members of the personnel and frequently gave professional aid to the natives of the village. In addition to this the doctor disposed of the bothersome land crabs by filling their holes with a mixture of sulphur and corn meal. He eliminated the mosquitoes by the application of oil to all stagnant water. He supervised the proper locating and upkeep of latrines and the immediate disposal of all refuse.

Upon the arrival of the hospital ship all of the inhabitants of the island were given a thorough medical examination and a clinic was established in the town for the treatment of the native sick. These precautions later proved their worth by preventing the spread of an epidemic of measles.

The Maintenance of a Fleet Operating from an Advance Base.—As previously stated in this article, the island selected as an advance base was unable to contribute one single thing to a fleet occupying it. To overcome this difficulty the following ships were employed: Five fuel ships, two colliers, two supply ships, two repair ships, and two hospital ships.

Each one of the fuel ships had a capacity of about 60,000 barrels of oil. These vessels averaged five trips each. The nearest available oil stowage was 700 miles from the advance base

and most of the oil was secured from ports more distant than that. Approximately 1,500,000 barrels of oil were delivered by these vessels. Add to this the coal supplied by the two colliers and the fuel taken on board fighting ships while at other ports and we find that it cost very nearly $4,000,000 to maintain the fleet in fuel alone.

One of the supply ships made two trips, the other three. Some conception of their importance can be obtained from the following figures representing fleet consumption while occupying the base: 2,548,590 pounds meat, 4,195,418 pounds vegetables, 527,994 pounds fruit, and 4,220,390 pounds dry stores.

Upon the two repair ships fell the burden of maintaining the fighting efficiency of the material involved in the occupation. The hospital ships served a similar purpose as regards personnel. A small fleet of mine sweepers and tugs performed their irksome but very important tasks in a most efficient manner.

Conclusion.—The proposition of preparing and maintaining the advance base has been shown to be a surprisingly large one, but it is dwarfed to insignificance when compared to a similar occupation that might be made necessary by a war. The advance base occupied in time of war would undoubtedly be at a much greater distance from the United States than was the one utilized for winter maneuvers. The force of marines engaged in this landing is but a small fraction of the force essential to the solution of the same problem in time of war. The chances are that there would be no adjacent island and it is a certainty that if such islands did exist they could not be depended upon for co-operation. The length of time involved in a wartime occupation would be much greater and the fleet employed would, of necessity, be larger. The question of maintenance would present a much more knotty problem and the harassing of our source of supplies by the enemy would add considerably to its complications.

The occupation of the advance base has been completed. The last ship has left the island and a single caretaker has replaced the 50,000 men engaged in that occupation. If the service has learned and will retain a lesson from this work the money and energy expended upon the task will not have been in vain.

FROM CAVITE TO PORTSMOUTH

A Narrative of the Cruise of the U. S. S. "Wilmington" During the Summer of 1922

By Commander L. P. Treadwell, U. S. Navy

EARLY in 1900, the *Wilmington* proceeded to the Asiatic Station via the Suez Canal. During the following twenty-two years of Far Eastern service, she became almost a landmark on the station, being well known to many of our own officers, to British army and naval officers, as well as to residents and travelers in the Far East. During the cruise home much interest was shown in the old ship and at nearly every port people were met who had known her or her officers in the old days. It is hoped that the following account may prove of some interest, especially to those who have served in the *Wilmington* at some stage of her long career.

She was built in 1897 by the Newport News Shipbuilding Company for a contract price of $280,000, and is a patrol gunboat of 1,392 tons displacement, 250 feet long, 39 feet in beam, and with a trial speed of 15.08 knots.

In May, 1922, a dispatch was received at the Asiatic Station ordering the *Wilmington* to the United States and calling for considerable haste in order that she might be turned over to the Ohio Naval Reserve on the Great Lakes, during the latter part of the summer. The ship was then at Hong Kong, and after such hurried preparations as could be made by the ship's force, she sailed for Lingayen Gulf, Luzon, where she met the Asiatic Destroyer Squadron which had been operating there for several months firing torpedoes. On May 22, the *Wilmington* arrived at Lingayen Gulf, and the next day numerous changes of personnel were made, mainly to provide for her, as nearly as practicable, a complement of men whose enlistments were about to expire, and of officers whose tour of foreign duty was completed.

During the afternoon of May 23, the weather became threatening and typhoon warnings were being sent out, among the latter

being a dispatch from the *Buffalo* at Manila advising the *Wilmington* not to sail. Inasmuch, however, as our orders were very urgent, and as the typhoon by morning was located several hundred miles to the northward and westward of Lingayen Gulf, it was decided to proceed to Cavite without further delay. After getting into the open sea, a long swell set in and the *Wilmington* began exhibiting the rolling qualities for which she has quite justly been celebrated for a long period of years. This did not seem to agree with our ex-destroyer oil burning firemen, and in a surprisingly short time the speed had dropped from 9.5 to 7.5 knots. About six A. M. the next day, off the entrance to Olongapo, the engineer officer suggested going in for water, but after a short consultation we decided there would be enough to reach Cavite, where we anchored at 5 P.M. that day, having averaged 6.2 knots for the trip of 200 miles. Two days later, viz., May 28, the *Wilmington* was inspected by the commander-in-chief, and on Monday, May 30, after having a few new boiler tubes put in, strengthening bands put on the stack, and exchanging all the old Chinese officers' servants for Filipinos, we hoisted the homeward bound pennant and proceeded to Olongapo for docking. On this voyage of sixty miles the average speed was 5.2 knots, and, since we had been able to make only 6.2 on the trip from Lingayen to Cavite, we were not encouraged with the prospects for our 12,000 mile journey.

After two days in the floating dock, at 7:53 A.M., June 2, we got underway on the first leg of our long journey, but not without, at the very outset, undergoing a few of the casualties to which we became so accustomed in the ensuing three and a half months.

Quoting from the writer's notebook written up daily during the cruise:

"2 June, 1922. 07:55 A. M. Hauled out of dock, Olongapo. Port engine would not turn over for ten minutes. Steering engine oil cup gone. Main stop #4 boiler jammed. One hour delay in cutting in. 10:08 took departure for Singapore, all boilers, fine weather, making about 8.8 knots."

For the next two days we bowled along merrily at 8.5 to 9.0 knots, having no serious casualties other than steering engine breakdowns and a beginning of our "salting up" troubles.

On June 6, our speed was reduced due to a considerable loss of vacuum. The weather was not so good either, and we began to

get a taste of the southwest monsoon, later to become almost a byword with everyone on the *Wilmington*. Frequent squalls were the rule, but we were getting into narrow waters and the sea was not bad.

At 11 A.M., June 8, 1922, we anchored in the man-of-war berth just outside the breakwater at Singapore, in the same place the Thirty-fifth Destroyer Division had anchored just one year before. Four days were very profitably spent here, the engineer's force working hard at cleaning boilers and general repairs and all hands enjoying the new and interesting scenes of Singapore.

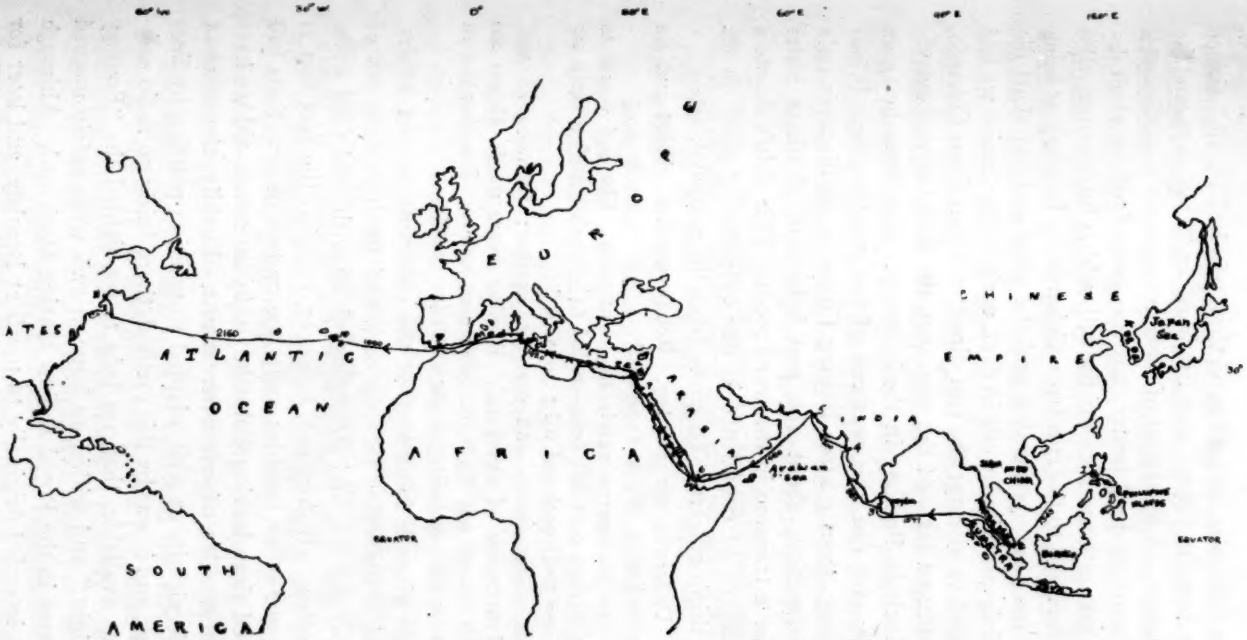
The run to Colombo commenced most propitiously, with perfect weather, engines running well, and a favorable current helping us through the Malacca Strait. However, an entry in the notebook about this time seems to have a premonitory tone:

"15 June: 1000 gr. salt in boilers. Blowing down twice daily. Feed water heater leaking badly."

These two items, salt and feed heater, caused endless worry and trouble throughout the remainder of the voyage as far as Gibraltar. Then it was something different; in fact, there was always something to think about in the way of unpleasant possibilities which frequently became certainties. On June 16, the feed heater was cut out on account of excessive leaking and was not again in working condition until July 26, in spite of continuous work.

"17 June at noon, only 6000 gallons of water on board. Heavy sea. Strong southwest breeze. 18 June: still going, but very shy of water. 20 June 4:00 P. M., arrived Colombo; almost out of water. Extensive repairs necessary."

For the five days since leaving Malacca Straits, we had been bucking the southwest monsoon. As everyone knows, but as most have forgotten, this wind reigns supreme on the Indian Ocean and over India, in fact, during the months of June, July and August; its so-called "breaking" is the subject of endless discussion in May and early June, and the word "monsoon" is heard everywhere and always. One who has not actually experienced the southwest monsoon at its height, like one who has heard of, but not experienced a typhoon, may be inclined to scoff, but both are worthy of the deepest respect of seafarers. A week



OUTLINE MAP SHOWING "WILMINGTON'S" CRUISE

1. Olangopo
2. Singapore
3. Colombo
4. Bombay
5. Karagni
6. Aden
7. Suez
8. Port Said
9. Gibraltar
10. Ponta Delgada
11. Portsmouth, N. H.

was spent at Colombo, and a "good time was had by all," except possibly our faithful "Mr. Chief Engines" as "Tze" says, and his trusty henchmen. A local firm of marine engineers was allowed a trial at the contrary feed heater, but was compelled to admit defeat and to take a large slice off the bill, which hurt worse. We had looked forward to the run from Colombo to Bombay as being a very easy one; only 900 miles, and the wind and sea abaft the beam, certainly promised well; in fact, early in the cruise we had almost decided to attempt the run direct to Aden from Colombo, but after getting a taste of the monsoon, the decision was quickly formed to include Bombay in the itinerary. Far from being an easy and pleasant run, this was one of our most trying. It was rather amusing, shortly after leaving Colombo, to discover on a Saturday inspection, about 100 pop bottles of drinking water stowed under a transom in the ward room. This didn't denote a very high degree of confidence in our evaporating plant on the part of the ship's officers. To quote from the notebook again:

"26 June. Underway for Bombay. Rough weather. Wind and sea from west instead of S. W. as expected."

"29 June. 350 m. approximately to go at noon. Changed course to 345°. 5:15 P. M. lost port life boat—rolled 54°—headed 315° to keep out of trough of sea and continued till 7:30 A. M."

"30th. Bad night—cloudy and overcast weather; forenoon of 30th, making good a course of about 15°. Bombay bears north, distant 200 miles. 10:25 A. M. cut out #3 boiler—soft plug leaking. Running low on water. Put new plug in boiler; using excessive coal."

The above gives a faint idea of the cheerful state of affairs, with the old *Wilmington* tacking back and forth to keep out of the trough of the sea, and struggling along with cold feed water and salty boilers. It does not, however, mention the fact that in addition to our other troubles, only one or two observations had been obtained since leaving Colombo, so by no means did we have a very accurate idea of our whereabouts. Luckily, the coast of India in this vicinity is well adapted to position plotting by lines or soundings, and it was by this method, there being no radio compass stations available, that, on July 1, we sighted the "Bombay Floating Light," and within an hour or two were safely moored between buoys in the Royal Indian Marine Dockyard. Although we had not intended originally to touch at Bombay, and later for only one day to coal ship, our actual stay there finally stretched

out from July 1 to July 9. The climate is not salubrious at the best, and during the southwest monsoon, it is actually vile. Rain fell continuously on some days, intermittently on others, but made little difference in the general moist and clammy condition of affairs. Shoes removed at night appeared in the morning with a rich coating of green mold. A slippery layer of mud coated the streets, and the British custom of black shoes with white uniforms was promptly adopted. The Royal Yacht Club was the oasis in the desert, or rather, the pleasantly "wet" spot in a most unpleasantly damp locality, and it, together with the "Willingdon (not Wilmington) Sports Club," was much appreciated by our officers. On the "Fourth of July," we attended a very enjoyable dinner-dance given by the American Community.

A few lines from the notebook may here be of interest:

"Bombay, 1 to 7 July. Worked day and night including Saturday and Sunday, on repairs below. Gave men 4th July off. Took 180 tons coal July 1st and 90 more July 7th, giving us a deck load of 60 tons on quarter deck."

"9 July, Sunday. Still at Bombay. Had expected to sail for Aden, the 10th, but Engineer Officer reports will not be ready till 12th. Decided proceed Karachi, a distance of 500 miles; will be about 230 miles nearer Aden. Hope to get everything in condition and O. K. by time we have coaled at Karachi. As reaching Aden from Bombay was uncertain, and as strong possibility existed of having to put about for Karachi after several days at sea, proceeding via Karachi may save a long delay, and at the worst, should not cost us more than the loss of one day."

"10 July, 11:30 A. M. Underway for Karachi—9.5 knots—180 revs. Long swell, but ship seemed to roll less and more slowly due to 60 ton deck load of coal. About 4 P. M. stopped starboard engine for about 15 minutes on account of leaky high pressure piston rod. 7:15 A. M. to 5:00 P. M. starboard engine stopped because crank pits and floor plates flooded due to bilge pump broken down."

"11 July. Boilers salting up again. At night running slow but engines unable to make less than 100 revs. due to leaky throttle valves."

In regard to the deck load of coal and the effect on the stability of the ship, it had appeared to me for some time that the excessive rolling of the *Wilmington* was possibly due to abnormal stiffness. With a flat bottom and wide beam, it seemed that the ship must be very stiff, and that this, combined with no bilge keels, might be the cause of her none too enviable reputation. The subject of a deck load of coal had long been under consider-

ation, and in Manila, calculations showed a probable change of only 2.5 inches in the metacentric height. At Bombay the matter was again investigated, and we proceeded with filling the forward part of the quarter deck. Wooden bulkheads, well braced, were erected outboard on each side, skylights battened down, doors closed, etc., and the coal filled in athwartships with a barrier of filled bags forming the after boundary about twenty feet abaft the bulkhead. Old awnings spread over the coal formed a good "caulking off" place, and a few planks with cleats and life lines made passage forward and aft easy.

At 5:30 A.M., July 13, we arrived off Karachi Harbor with a long swell running, which broke slightly near the breakwater. We spied a tiny pilot boat bobbing around, and succeeded in getting a line to it, after which it periodically approached our sea ladder, but did not remain long enough for the pilot to get aboard, so we went inside towing the boat and pilot alongside and were soon secured to a buoy coaling ship.

"14 July. Set 11 A. M. as time to get underway, but at 8 A. M. water barge came alongside with water containing 6 grains chlorine. Immediately reported to harbor master who sent the one other water barge of Karachi, which, however, had 9 grains. Harbor master came on board. No better water in Karachi. In view of previous trouble with salt and long, hard trip ahead, this is bad luck."

"14 July. Underway—12:15 P. M. big swell outside, but fair weather. Light breeze, and ship taking seas nicely. Set standard speed as 200 revolutions, 10.6 knots—hoping to take full advantage of good weather. However, unable to make this speed, and for first 20 hours only made good 7.5 knots per hour."

We proceeded on our way finding the sea for two days almost undisturbed except for long heavy swells coming up from the southwest, and gradually increasing. On the third day, the wind came with a consequent reduction of our speed and comfort. The feed heater was tested but leaked badly and could not be used. The bad coal received at Karachi had fouled up our boilers so that even with the better coal we could not make more than 8 knots.

Quoting again from the notebook:

"18-19 July. Very rough sea, long swells. Making good 5-6 knots. Running shy on water. Second two days made 172 and 128 miles respectively. During night rolled 53°, and shipped water down ward room skylights."

"19th A. M. Had to stop both engines for a few minutes on account main circulator. Night of 19th very bad one; got in phase with seas and rolled heavily making sleep almost impossible."

"20 July, 6 A. M. Changed course 15° to southward to get more out of trough. This improved conditions. This A. M. Chief Engineer appeared on bridge and said his department was rapidly becoming a wreck from heavy rolling. Sent Chief Boatswain's Mate and some men to help secure spare propeller blades and feed heater tubes which had gotten adrift. At 8:00 P. M. headed 200° to bring wind and sea abaft beam and close to the coast. Ran this way till 1:00 A. M., when headed 240°."

"21 July. Weather conditions much better. During night nearly ran out of water, being unable to get suction to bottom tanks; rigged connection to condenser through sounding tube and got water out by vacuum."

On July 23, the *Wilmington* arrived at Aden, fourteen days out from Bombay, and nine from Karachi, and mighty glad we were to be there, feeling sure that now the worst of the journey was over, at least until after we left Gibraltar. On the run from Karachi to Aden we averaged 7.1 knots.

"24 July. Took 190 tons coal. Plenty of work below to keep engineer's force busy."

"26 July. Had intended to sail 25th, but waited one day extra to make contact with *Sapelo* for information on pay and appropriation bills. Unable to get enough water ashore to fill up, so at 4:30 P. M. got underway and went alongside *Sapelo* and got 15000 gallons. This was probably the first time the *Wilmington* was ever alongside an oil tanker."

The *Sapelo* had come in to fuel the destroyers and *Black Hawk*, then enroute to the Asiatic Station, which arrived Aden, July 27, the day after we sailed.

The run to Suez started propitiously and but for the discomfort due to the heat of the Red Sea proved one of our best ones. The entries for this run have a less melancholy tone than some of those already quoted:

"26 July 8 P. M. Sailed for Port Said. Made 8.5 knots easily and 150-170 pounds steam. Feed water 230°. (Rather hot water or a very efficient thermometer)."

"27 July—Making good progress up Red Sea but fearfully hot."

"29 July—Still making 8.5 knots. Ran into blow and sand storm. Considerable motion. Weather very hot but good breeze. Several men getting sick; nine on list, 25 at sick call this A. M."

The remainder of the run to Suez was uneventful except for entering port at 7:00 A.M., being boarded by health and canal officials at once, and then having a long wait for necessary papers

before starting through the Canal. During that night a radio was received from "Operations" to the effect that the necessity for extreme haste no longer existed and directing us to proceed at a speed consistent with the safety of the vessel. The part of this dispatch referring to speed caused some slight amusement on board, but the solicitude of the Department was appreciated. We passed through the Canal as No. 4 in a convoy headed by three tramps, and, except for having to tie up to the banks twice to allow south bound traffic to pass, our trip in the Canal was uneventful, and we were able to keep within official distance (fifteen minutes' time) of our leaders and not to break the convoy. At 3:30 A.M. on August 2 we secured in Port Said Harbor, where numerous repairs were again necessary both by contractors and ship's force.

Five days of refreshingly cool weather, with plenty of swimming in the Canal, made the cruise in the Indian Ocean and the Red Sea seem like a bad dream. On August 8 we were once more on our way, but this time what a difference! The beautiful, smooth blue sea, balmy air, and pleasant sunshine made cruising delightful, and the good effect on all hands was evidenced by the successful run of nine days to Gibraltar. A brief entry from the notebook describes our principal troubles:

"16-17 Aug. Making lots of turns and all O. K. except for salt and leaky condenser. 1600 grains chlorine in boilers, but no indications such as priming, salt crystals, etc., boilers apparently steaming as well as with fresh water, made 254 miles for 24 hours."

This was our greatest day's run during the summer.

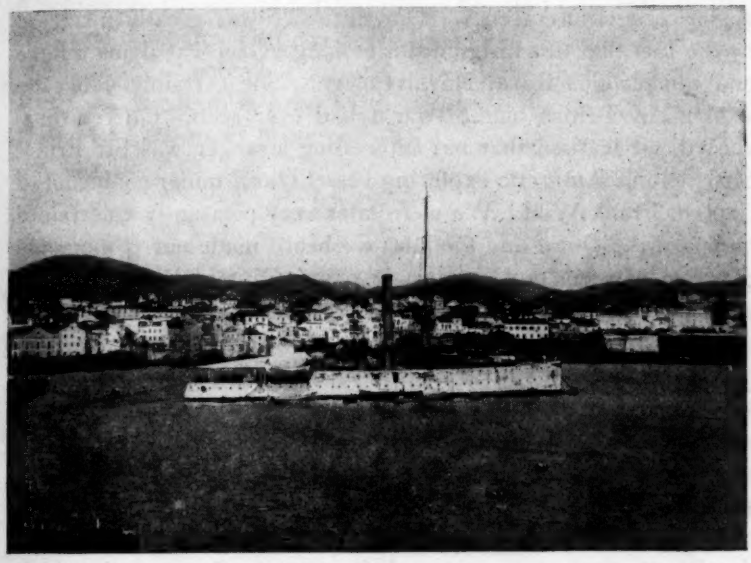
While at Port Said an Opnav dispatch had been received by the Commander Naval Forces European Waters, suggesting that the *Sapelo* escort the *Wilmington* from Gibraltar to Portsmouth. N. H., towing as necessary. This was not considered necessary as we were in better condition than when leaving Manila, but casualties later on forced a reversal of this decision.

We again had numerous repairs in Gibraltar, some by contract ashore, and upon getting to sea after a day or two of delay in the work we appeared to be in good shape and all set for an easy run of about 1,100 miles to Horta. Our good fortune did not endure long, however, as indicated in the following entry:

"2:45 P. M. 22 Aug. Stopped starboard engine for repairs."

"Later. While connecting rod was disconnected, the engine made several revolutions due to jacking gear jumping out and free end of connecting rod threshed about. Later, strong back to which piston and rod were hoisted, carried away and piston fell with heavy jar."

It was only by good fortune that several men were not seriously injured by the free end of the connecting rod, and that either the piston or cylinder were not damaged by the fall, as the noise and jar could be heard and felt all over the ship. Meanwhile, there being no further injury due to these two mishaps, we proceeded on our way at two-thirds speed with the port engine,



"WILMINGTON" AT PONTA DELGADA, AZORES, AUGUST, 1922

making good about 4 knots. Luckily the sea was smooth and next morning we were ready to start the starboard engine. Everything continued favorable until about 9:30 A.M. on the twenty-fifth, when, being distant 400 miles from Ponta Delgada, the chief engineer appeared on the bridge to report that the port engine had been stopped and upon investigation the low pressure crank shaft had been found to be broken, and no spare on board. The broken shaft was removed, replaced by the one from the high pressure cylinder of that engine and the engine compounded using the low and intermediate cylinders. This was completely

finished in two and a half days. In the meantime we had been making good about 5 knots with the other engine. By using some old sections of awning rigged as sails, we had been able, thanks to a beam wind, to keep the rudder amidships.

On August 28 we arrived at Ponta Delgada. Our latest trouble was reported, with a request for escort by the *Sapelo,* which was still in Europe, but bound for New York in the near future.

One bright Sunday afternoon while we were enjoying a view of the harbor and sea from a veranda on the hill above Ponta Delgada, a small, black, strange-looking vessel appeared, slowly approaching the entrance. Our curiosity was greatly increased by the fact that this insignificant looking vessel was flying a large and conspicuous Royal Naval Ensign. She certainly didn't resemble any British man-of-war I had ever seen. On returning aboard, we learned that our interesting stranger was Sir Ernest Shackleton's Antarctic exploring vessel *Quest* under command of Captain Frank Wild. We were later very pleasantly entertained on board the *Quest* and the tales we heard made our *Wilmington* experiences seem quite tame. It seems Captain Wild had done some twenty years of polar exploration, having been a seaman in the *Discovery,* on Captain Scott's first voyage. Later, on looking over Captain Scott's book describing the cruise of the *Discovery,* which I had read during our cruise, I found several interesting places where Captain Wild's name was mentioned. He told me that after he got the *Quest* to London he and a friend of his were going to Central Africa to run a ranch 150 miles from the nearest railroad or neighbor. Shore boats began operations shortly after the *Quest's* arrival in port and despite all efforts of the ship's officers, partially succeeded in slacking the terrible thirst of a number of the Antarctic seamen. While we were looking around the ship, one of these intrepid but slightly inebriated sailors attached himself to the party. He was quite interesting and was making himself pleasant and agreeable, somewhat to the embarrassment, however, of the ship's doctor who was showing us around; the latter, not wishing to mar the occasion, whispered a word in the sailor's ear and drew him around the corner of the pilot house. The next instant we heard the unmistakable sound of a heavy fist coming in contact with an unknown portion of our sailor friend's anatomy, and caught a glimpse of him being

carried below by a couple of shipmates—all this without the doctor's turning a hair or even losing the thread of his story. An illustration of the prompt and summary justice incident to that sort of service.

We joined the *Sapelo* south of Ponta Delgada on September 9, and soon were making good 9.5 knots at the end of a long towline, the *Sapelo* making revolutions for 10.5 and the *Wilmington* for 7.0 knots.

For ten days continuously without once stopping the engines of either ship, the expedition proceeded westward. On the morning of September 19, we sighted Nantucket Shoals Light Ship, where we parted company with our good friend the *Sapelo*. Early the next morning, September 20, we entered the harbor of Portsmouth, N. H., and secured to the dock at the navy yard, our cruise of 12,300 miles being completed.

A STRANGE ADVENTURE IN WALES

By Captain Frank Pleadwell (MC), U. S. Navy

NO FLIGHT of imagination in which we had indulged in relation to our probable travels abroad as observers during the war had included the inland region of North Wales among the places to be visited in connection with official inspections. Nevertheless, the improbable happened and late one afternoon in the month of April, 1917, we found ourselves traversing that most picturesque region and after a seven hours' railway journey from London arriving at a station by the name of Bala.

Equally noted for its wild scenic beauty and for its famous characters in history, of whom Owen Glendower, the Welsh rebel, and Henry Morgan, the pirate, come to mind, this region of Wales has also provided inspiration for several noted writers beginning with Spenser in the distant past and coming down to George Borrow in more recent times. Scott, Pennant, DeQuincey, Wordsworth and Tennyson have all contributed their share in literature to make this region better known, and still others, in seeking it out as a place of residence, like the Ladies of the Vale of Llangollen and Hester Piozzi, who, as "Mistress" Thrale, was Johnson's genial hostess for twenty years, have supported its favorable reputation in their journals or letters.

It all came to pass in this wise. On the morning of April 20, 1917, we were summoned to the sanctum of the naval attaché at the American Embassy in London, and presented to a gentleman there. An intimation made to us just previous to the interview indicated that the gentleman had something of importance to convey. We were also told that after receiving information from him it would then be our duty to proceed to North Wales for the purpose of investigating certain experiments being conducted there on Lake Bala. It added to the zest and interest of the adventure to be informed that the project was of a highly confidential and secret character.

This was all that was vouchsafed to us during the preliminary

introduction. A little later, however, the visitor himself sufficiently revealed the nature of the enterprise. We then had one of two inferences to make, either of which at the time seemed entirely justified. One was that we had to do with still another member of that class of well-meaning, but often misguided individuals who overwhelmed us soon after the entry of the United States into the war, namely, the "how to win the war" enthusiast, with his pet scheme, which he was willing to part with (for a consideration). The other was that we were confronted with a frank lunatic.

However, we soon absolved Commander L. C——, from these implications. He did not betray any sign of mental alienation nor did he suggest the type of person who had haunted the corridors of the embassy daily since April 7. As he developed his subject further we realized that in spite of certain ludicrous aspects of it a serious matter was under consideration which would require an impartial attitude of mind and a spirit of scientific inquiry on our part in order to do it full justice.

It will be recalled that in the anti-submarine operations about the coasts of Great Britain and Ireland during the late war, the enemy submarine often escaped by timely submergence before the anti-submarine craft had approached near enough to do effective damage. Once submerged it became a matter of guess work where to put down the depth charge barrage in order to reach the enemy vessel; and often the latter was successful in eluding attack either by submergence alone or submergence followed by "creeping" along the bottom.

The huntsman stalking a deer or the sportsman approaching a bird would stand perhaps an equivalent chance of failure were he not able to depend upon the assistance of a faithful retriever, trained to indicate the bearing or position of the hidden prey, and at command to flush it into the open within gunshot range. The query arises, why not apply this analogy, in a practical way, to the "hunting" of submarines, and develop a "sea" retriever capable of indicating accurately the submerged position of a hidden submarine?

For obvious reasons, not all animals would be eligible for this duty. Of necessity one must be sought for whose normal habitat was the sea, and presumably one that was amphibious in its mode

of life, rather than purely aquatic. With these desirata met, intelligence and adaptability for training would then assume a prime importance. These latter conditions satisfied, then acuity of vision or sharpness of hearing, or both, but preferably the latter, as being perhaps the more important, would be among the other accomplishments of value in this connection. However, as it is very doubtful whether any animal can see more than a few fathoms under water, keen hearing alone, or hearing combined with an unknown sixth sense, constitutes the more important characteristic to be possessed by a sea retriever in order to qualify for the exceedingly strange duty of tracking submarines beneath the surface of the sea.

Possibly some of our readers have guessed the species of animal which was selected and trained for the unique experiments about to be described, but no doubt others are still scanning the field of zoology for the most likely candidate, and reviewing particularly the amphibians.

One thinks of the whale, but the whale cannot well qualify. He is a notoriously stupid creature, else why has he suffered himself to be made use of by man to an extent almost resulting in an extinction of the species? Moreover, the whale is a little too unwieldly to be adopted as a pet on board a submarine chaser. Others with a more imaginative turn of mind, recalling an alleged weakness of sailors, have thought of the mermaid. But I fear that since the days of P. T. Barnum, mermaids have passed to the oblivion of discredited myths together with the phoenix, the dragon, the unicorn, and the man with a tail, or have been relegated to obscurity with the other legendary creatures of our fairy tale days.

Doubtless it has been within the experience of many who read these lines to have seen at one time or another the so-called "trained seals" of the traveling show or the vaudeville performance, and to have noted their marvelous intelligence and their adaptability for training. These animals also possess superior powers of hearing. This combination of faculties, intelligence, susceptibility to training, and sharpness of hearing, makes the sea lion, often erroneously called the seal, the creature of all others best equipped for tracking submarines.

For the reasons just given this was the species of animal se-

lected and trained for the mission defined above. Its maneuvers in the process of training to fulfill this mission we were about to witness in the charming setting of Lake Bala in North Wales.

Few of the incidents of that day's travel to Bala are now recalled, but its tedium was greatly relieved by the companionship and conversation of our fellow-traveler, Sir R. A. S. P——, and by the study of the varying landscape as we passed from England into Wales and up the valley of the Dee, through that country referred to so charmingly by Washington Irving in the *Sketch Book* as "of that pastoral kind which Walton is fond of describing. It was a part of the great plain of Cheshire close by the beautiful vale of Gresford, and just where the inferior Welsh hills begin to swell up from among fresh sweet-smelling meadows."

Many of the towns traversed recalled associations of rare historical and biographical interest. At Gresford, Samuel Warren, the author of *Ten Thousand a Year,* was born, and here lived Eliot Warburton, the author of *The Crescent and the Cross.* Wrexham is of special interest to Americans, for in the churchyard Elihu Yale lies buried, his tombstone carrying an epitaph which has been referred to by Thomas Pennant as revealing "an uncommon variety of fortune." It runs as follows:

> Born in America, in Europe bred,
> In Africa traveled and in Asia wed,
> Where long he lived and thrived; at London dead,
> Much good, some ill he did, so hope all's even,
> And that his soul thro' mercy 's gone to heaven.
> You that survive and read, take care,
> For this most certain exit to prepare,
> For only the actions of the just,
> Smell sweet and blossom in the dust.

Near Ruabon is Wynnstay, for several generations past the country seat of the Wynn family. Sir Watkin Williams Wynn, the present proprietor, is the seventh baronet of the name of Wynn and it was at his place on Lake Bala, the fishing lodge Glanllyn, that we were to rest that night. Sir Watkin owns many acres in this part of Wales and the breadth and extent of the Wynn holdings is well illustrated in the following story which refers to an ancestor of the same name as the present owner:

"One funny story . . . which is told of Sir Watkin Williams Wynn,

in the old coaching days. A tourist of an inquiring turn of mind joined the coach on its way to Bala. Inside he found a stout gentleman enjoying a nap. When he awoke, the tourist asked whose was the farm they were passing. "Mine," was the reply, and the gentleman again slept. Another wakeful moment, and another question: "Whom may that mountain belong to?" "To me"; followed by another doze. Again came a wakeful moment and the question, "Do you know who is owner of that valley?" with the answer, "I am not sure, but I think most of it's mine." No more questions were asked, but when the coach reached Bala, the tourist bolted into the hotel, saying—"I have been riding with either a prince or a devil." "You are right," replied a native, "You have been riding with the Prince *in* Wales, and a devil*ish* good landlord!"

At Wynnstay in times gone by were staged princely entertainments. It is chronicled of one, held in the year 1770, when the son and heir to the Wynn estate came of age, that a banquet of Gargantuan proportions was given, at which there were 15,000 guests, and the amount of good things consumed was enormous. According to an old manuscript formerly preserved at Wynnstay "three coaches full of cooks were sent from London for ye occasion." The Wynnstay Hunt was another celebrated yearly event in the history of the house, and almost as many people flocked to this as to a "coming of age."

We have often wondered if a certain passage in a letter now in our possession, written by Thomas Pennant (author of the *Tour of Wales* and correspondent of Gilbert White of Selborne), does not, by chance, refer to one of these splendid festivals, probably the "Hunt." The letter is dated from Downing, June 15, 1779, addressed to an unknown correspondent, and the passage in question reads as follows: "I am just returned from the princely festivities given annual[ly] by Sir W. W. at Wynnstay. I have a strange medley in my head of wrecks, dead bodies, mobs, plays, etc. The fun was a terrible duty, but the plunder and loss of the [farm] owners is sadly misrepresented in the papers."

Beyond Ruabon is Llangollen, whose celebrated "Vale" is, by local tradition, alleged to be the scene of Scott's "Betrothed." This spot was the haven of rest and quiet sought by those most peculiar personages, Sarah Ponsonby and Lady Elinor Butler, known and referred to in literature as "The Ladies of the Vale," and as "The fair recluses of Llangollen" (de Genlis). To tell the story of their adventurous escape from Ireland, their attempted

but unsuccessful sequestration in this beautiful region for over fifty years, and to relate the incidents of their hospitality toward a long line of distinguished visitors, Wordsworth, Scott, Burke, Madam de Genlis and others, would take us far beyond the limits of this article.

After leaving Llangollen we soon arrived at Bala. There we left the train. The town is pleasantly located in a fertile valley at the eastern end of Lake Bala. The view up the valley beyond the head of the lake revealed the ranges of Cader Idris and the Arans, and to the west was Aremy Favor. Bala, we were told, was famed for the beauty of its women, and many of the Welsh bardic poets refer to "the fair maids of Merion." It is said that Lord Lyttleton remarked that he had seen here "some of the prettiest girls he ever beheld." We were not so fortunate as some of our predecessors. This region formerly produced knitted stockings, Welsh cloth and lindsey, but the introduction of machinery in northern towns has nearly ruined the trade here.

Lake Bala is the largest natural sheet of water in Wales, being four miles long and over one-half mile wide. It is picturesquely situated at the foot of wooded slopes and under the shadow of the surrounding mountains. Its greatest depth is 130 feet. Pike, perch, rock, char, trout, and eels are found in its waters, but it is also the habitat of the Alpine fish called *gwyniad* (white), from the whiteness of its scales. Although the waters of the River Dee pass into and emerge from the lake, the salmon of the river and the *gwyniad* of the lake never exchange places; that is, salmon are never found in the lake, nor the *gwyniad* in the river, and local tradition also avers that even the waters of the lake and river do not mix. The derivation of the word Dee is *Duw,* the same as the French *Dieu,* a relic of the time when mountains and rivers were deified.

Spenser wrote:

> Dee, which Britons long ygone,
> Did call divine, that doth by Chester tend,

and Milton has also made a reference to "Deva's wizard stream."

Tennyson has referred to Lake Bala and its gentle zephyrs in "Geraint and Enid," where he speaks of Enid's tender care of Geraint:

> And Enid tended on him there. . . .
> As the South-West that blowing Bala

Lake fills all the sacred Dee.
So past the days, etc.

Much of the "Idylls" was composed in this neighborhood. The lake looked very placid as seen in the near distance, but we were told that on occasions there are bad storms on Bala, as sudden and dangerous as those on Lake Gennesareth.

A short drive from the town of Bala soon brought us to Glanllyn, and there we were met by the staff then conducting the experiments. This staff comprised a naturalist, Doctor A——; a naval representative, Lieutenant N——; Mr. W——, the sea lion trainer, and his wife, all of whom gave us a hearty welcome. Although it was close upon the evening hour when we arrived at Glanllyn, there was still light enough remaining for a turn about the lake with one of the sea lions, and preparations were soon made to this end.

The fishing lodge at Glanllyn rests upon a knoll near the southern extremity of the lake, and along the shore line near by were arranged the landing stages for the boats and launches used in the operations. There also were the shelters for "stabling" the sea lions. Accommodations for about fifty animals were provided but only a few of the "stables" were occupied at the time of our visit. The stables were small cages enclosed with woven wire screens, each having its own private bath, and a dry board shelf where the sea lion could rest and sleep at night.

The first individual of the sea lion community to whom we were introduced was of the gentler sex, and when we heard her name, "Queenie," we could but recall the strange coincidence of this name with that of another visitor to these parts some 137 years ago, for "Queenie" was Doctor Johnson's pet name for the eldest Miss Thrale, Baretti's pupil, the exquisite artist on ivory, who accompanied her parents and Dr. Johnson on a tour of Wales in 1774. Famous for her beauty and noted also for her "glacial calm," in spite of the latter quality, she became, in 1808, the Viscountess Keith. During the tour, when the famous doctor grumbled about some annoyance or discomfort, Mrs. Thrale made bold to remark that "with his complaints, 'Queenie's' apathy, and the taciturn Thrale she had to be polite for all four."

In the light of the foregoing reference to the characteristics attributed to Johnson's "Queenie," we failed utterly to compre-

hend why the same pet name had been bestowed upon our *première* lioness at Bala. Neither "glacial calm," nor "apathy" nor even "beauty," though there might be a difference of opinion about the latter, were appropriate characterizations for our "Queenie," who seemed always tremendously interested in her surroundings, was generally in a state of constant, nay, almost nervous activity, and as sea lionesses go, was most sociable and friendly. But in this matter of "labels" for the different members of the sea lion family at Bala we were forced to conclude that resemblance to the characters whose names were adopted was not a controlling factor. For example, why should a large, untamed, rather elderly female, who proved resistent to training have been named "Beatty," and a young male, of a peculiarly nervous disposition, be dubbed "Joffre"?

"Queenie" was about three years old at the date of our visit and weighed quite 100 pounds. She was on loan from the Zoological Society of London, and was considered next in prowess in her performances to her partner, "Billiken," who was temporarily absent, having been returned to the music hall stage, where he had been performing previously, to fill a vacancy caused by a recent casualty in the sea lion troupe. "Queenie" had undergone a preliminary training in a swimming pool before coming to Bala, but even prior to this she had been petted, stroked, fed, and otherwise cajoled into becoming better acquainted with the genus *homo* in the person of her trainer, and with the human voice. When the trainer had won her confidence thoroughly, then the swimming pool experiments were begun.

Fitted with a wire muzzle over her snout and liberated in the pool, she was gradually taught to respond to various underwater sounds. Every successful attempt was rewarded by a full feed of oily fish which were dropped down her capacious throat, bones and all, and in this way she finally developed a "cupboard conscience." The fish were conveniently administered by passing them through a spring trap door in her wire muzzle. This muzzle was adopted in order to prevent the sea lion from successfully chasing live fish in the pool (and subsequently in the lake) and thus becoming diverted from the chief mission of retrieving an underwater sound. Live fish were placed in the pool intentionally for the purpose of simulating the natural conditions which would

of necessity be encountered later, in the practice at Bala and elsewhere. Nevertheless we were informed that occasionally the sea lions did wander off on side excursions in the lake, seeking pike and pickerel despite the muzzle and the previous training. It required some little time to teach them to disregard the presence of live fish and to think only of the dead ones which would be their luscious portion upon accomplishing the desired feat.

The preliminary training in the swimming pool extended over two weeks' time and "Queenie" had been at Bala for about three weeks when we arrived. At Bala it was possible to carry the training much further, not only as to the distance over which runs were made, but also in using a greater variety of calling sounds and possibly those which might be made by a submarine when submerged. As secrecy was an important element at this time, Bala was an ideal place for the experiments, for the lake, and the appurtenances necessary for trials, dwelling places, etc., were all within the estate of Sir Watkin Williams Wynn, and hence readily controlled and easily protected from inquisitive individuals and others.

"Queenie" was brought down from the stable to the launch in a crate with a sliding door, which was then approximated to a similar door in the deck house built on the launching stage at the boat. Buoys and rafts had been placed at appropriate places in the lake for convenience in taking bearings. Inasmuch as the first evening's work with "Queenie" was limited by the approach of darkness and the near-by prospect of dinner, we shall base our story of her performances upon the events of the succeeding day.

Before describing a typical series of experiments, let us elucidate a slight obscurity which lingers in the minds of some with respect to the true zoological position and characteristics of the sea lion, as compared with the seal. The sea lion (*Otariidæ*) has a small external ear, the palms and soles are naked, that is not covered with hair, and the hind limbs are capable of being turned forward and used in locomotion on land. The seal (*Phocidæ*) has no external ear, the palms and soles are hairy, and the limbs stretch out behind and are of little or no use in locomotion on land. The strange jumping movements of the seal on land are effected by movements of the trunk, sometimes helped by the fore limbs. The natural habitat of the species of sea lion used in these

experiments at Bala is the Lower California coast. There are other differences between the two animals, but the above-mentioned points are sufficient to differentiate them.

The natural food of the sea lion is fish. A supply of fish was sent daily to Bala; at first from Glasgow, and afterwards from Grimsby. Herrings are considered the most suitable, and the animals worked much better when these were supplied. Failing herrings, whiting or small haddock were used. The sea lions would eat the fresh water fish but preferred the others. The sea lion is reputed to be hardy, stands transportation well, and is easily cared for. They do not, however, flourish under warm weather conditions.

On the morning of April 22, 1917, fine weather prevailed in North Wales, and we had an ideal day for the experiments on Lake Bala with the sea lion. After breakfast we embarked with "Queenie" aboard the launch and moved out into the lake, a second craft taking up a position some thousand yards away, for the purpose of acting as the calling boat.

The work of the previous evening had served to convince us of the ability of a swimming sea lion to hear underwater sounds of low intensity, to respond to such sounds, and to follow them to their source at a considerable distance with remarkably even success. There were failures, but not more often than would be made by a well trained dog in retrieving a bird. Not only did the sea lion respond to calling sounds from one boat to another but if the calling boat was signalled to cease calling, after the animal had started toward it, and a third boat in an entirely different direction was signalled to take up the call, the sea lion promptly changed course and assumed the new line of advance in the direction of the new call.

On this day we were to witness trials even more convincing than those of the previous day. One interesting feature of "Queenie's" performances on Lake Bala was her surprising agility. This animal, from its natural configuration, suggests clumsiness, and its movements on land are far from graceful, but the ease with which "Queenie" leaped from the water and landed on the gunwale of the moving launch was quite surprising. Whenever, upon completion of a run, she was recalled, she came alongside, paralleled the course of the launch, keeping abreast of

it, and soon leaped from the water and landed on board. This feat involved accurate judgment, for the launch was moving at a rate of speed of about 6 knots, and the gunwale on which she landed was only five inches wide. The distance from the level of the water to the gunwale was about three feet. Once aboard the launch, "Queenie's" first thought was of the fish which were kept in a bucket forward and she clambered along the gunwale in that direction for the customary "feed." If this feat had not been witnessed, as it was several times, we should have said *a priori* that it was impossible of accomplishment by an animal which appears as ungainly as the sea lion.

After the trials of the previous evening we gave voice to a suspicion that the sea lion might not be wholly dependent upon the sense of hearing for guidance to the place of origin of the underwater sound, but that sight also might play a part, for the animal might have learned to associate the sound with the image of the boat from which it was produced, the boat being seen easily at any of the distances employed. Therefore a part of the second day's trials was devoted to this problem of determining whether or not the sense of sight played a part in helping the sea lion to its goal.

Instead of having the sound-producing mechanism managed from a boat, it was enclosed in a tin case, and this case was submerged several feet below the surface of the water, with a small buoy (bladder) attached to aid in locating and recovering the apparatus, when the test was finished. No other mark or craft of any sort was to be nearer the point of submergence than 100 yards. The observing boat was about 200 yards away and the distance from the point where the sea lion was to be liberated to the point where the sound was to be produced was about 800 yards. Somewhat to one side of the line between the place where "Queenie" was to be liberated and the location of the sound-producing apparatus, but not nearer to the latter point than 100 yards, a raft was moored, and on this raft was placed a pail of fish.

"Queenie" was then set free, and after some circling about the starting point, she took up the "scent" and was off in the direction of the sound. She passed the raft by without a moment's hesitation (and also the lure of the pail of fish) and soon

reached the point where the "buzzer" was submerged, where she stopped and began swimming about in small circles over the area of greatest intensity of sound until we came up and took her aboard. This experiment went far to convince us that hearing alone sufficed to enable the sea lion to trace an underwater sound to its point of origin.

And so the trials went on until evening, and the discussions over them with Sir R——, Dr. A——, Lieutenant N—— and Mr. W——, continued late into the night. Enough has been written already, we think, to show that the ability of the sea lion to act as a retriever for underwater sound was proven, and provided eventually that the calling sounds were made to resemble the sounds produced by a submarine when submerged, both at rest and underway, and under service conditions, the application of the results of these experiments was obvious.

Of course the distances at which responses on the part of the sea lion can be made is of great importance in practice and we were told that the longest successful swims to a sound were done by "Queenie," just before our visit, when she swam practically three miles from Mala to the raft off Glanllyn several times, and also twice in the reverse direction. When these extreme distances were run the animal seldom responded as promptly as with the short distances, and often swam about for several minutes, and sometimes endeavored to return aboard the boat, but was always driven off until she became convinced that she had to finish the performance. Then she generally started off in the right direction.

We were favored with fine weather again on the twenty-third and entered upon the program of what was to be our last day at Bala. Comment has been made upon the difficulty experienced in following the sea lion when once it has taken up the "scent" (sound) and started away on its course. If, in order to see the sea lion more plainly when it comes to the surface momentarily to breathe, often less than a second, the observing boat approaches too closely to the swimming animal, the latter is apt to become distracted or confused by the presence of the boat and possibly diverted from maintaining its course by the preponderance of the propeller sounds over those of the sound-producing mechanism. Various expedients were suggested to overcome this difficulty and one of them we were to try out on this, our last day.

It was an interesting fact, observed by our associates on previ-

ous trials, that the sea gulls present on the lake were very curious over the presence of the sea lions, and tended to follow them on their runs, circling overhead, and swooping down each time the animal came up to breathe. We were told that on several occasions when a sea lion had been lost to sight its position was indicated by the behavior of the gulls. Dependence upon gulls, however, was uncertain, and other methods of indicating the course of the sea lion were sought. Various suggestions had been made the object of which was to render the sea lion more visible, such as painting the head a brilliant crimson, and for night work, painting the animal with a phosphorescent paint.

Today we tried the plan of attaching a small stream line buoy, on a length of piano wire, to "Queenie," the buoy floating on the surface at some distance behind her. The wire was fixed to a girdle which buckled around her body and to render the buoy more visible it was painted a bright red. This method worked successfully enough, but its operation introduced technical difficulties and no doubt the buoy and wire, etc., impeded somewhat the free movements of the sea lion and diminished her speed. A higher observing position on the following boat, or the spotting of the animal's course from a sea plane were both suggested as means to be employed to enable the observers to keep accurate track of the sea lion when retrieving a sound.

With the completion of this last series of trials our duty at Bala came to an end. We agreed that it had been a most interesting adventure, unique in our experience during the war. So, after a fond farewell to "Queenie" and to our agreeable companions at Glanllyn we drove with Sir R—— to the station at Llanuwchllyn, where we boarded the train for London. Sir R—— stopped off at Ruabon to go to Wynnstay, there to pay his respects to Sir Watkin Williams Wynn.

It was late afternoon when we arrived in London, but not too late for a meal at Odone's before entering upon a full evening's work at the embassy in preparing our official report. When that report was laid before our chief on the following morning he had no recourse but to cable home and advise the immediate purchase or capture of additional sea lions. What would we not have given for a glance at the faces of those who read this message upon its arrival within the precincts of the Navy Department in Washington!

THE NAVAL GUN FACTORY

By Lieutenant Commander R. P. Guiler, Jr., U. S. Navy

FROM general knowledge, and my own personal experience, I am of the opinion that the average naval officer has but a vague idea of the Naval Gun Factory, its mission, its relation to the fleet, Bureau of Ordnance and the naval service at large. The intent of this article is to give in a brief manner a working knowledge of the Naval Gun Factory and its various functions, such as might be gleaned from a short visit to the plant.

In view of the fact that the Naval Gun Factory, situated in the Washington Navy Yard, is in reality an outgrowth of that station, it is considered essential, in order to make the story complete, to touch briefly on the Washington Navy Yard, its beginning and its present sphere of influence, in leading up to the establishment of the Naval Gun Factory and its subsequent expansion.

I. The Washington Navy Yard

*Historical**—On February 25, 1799, owing to "a great national emergency arising from French aggression upon our commerce, assisted by an eloquent appeal of Benjamin Stoddert, Secretary of the Navy——," Congress appropriated $1,000,000 for the building of six of the "largest ships of war."

In order more expeditiously to accomplish this purpose, and at the same time lay the foundation for a permanent Navy, the Navy Department proceeded to apply a portion of this appropriation to the purchase and development of grounds for six navy yards to be located as follows: New York, Philadelphia, Boston, Portsmouth, Norfolk and Washington. The Washington Navy Yard was among the first to be started, it being considered at that time as

* Note: The greater part of the information contained in the "Historical Section" of this manuscript was obtained from *A History of the Washington Navy Yard*, by Henry B. Hibben, A.M., Chaplain, U. S. N., written in 1889. Other data were obtained from official records and various other sources, all of which are authentic.

of the greatest importance, due to its proximity to the Navy Department.

In the words of Secretary Stoddert, the purpose of the Washington Navy Yard was "for capacious building and dock yard." To this end, forty acres of land (present location) was purchased in the latter part of 1799, at a cost of $4,000.00. The construction of one of the six frigates was immediately started.

Captain Thomas Tingey, U. S. N., was ordered to duty as "Superintendent of the Yard" on January 22, 1800.

Mr. B. H. Latrobe, "Architect and Surveyor of the Public Buildings of the United States at Washington," made the plans and specifications of the navy yard and buildings, which plan was approved by the Secretary of the Navy in 1804.

From the records, it would appear that there were "little navy" men in Congress even in those days, since sometime during the early part of President Jefferson's term of office, "an act, providing for a Peace Establishment," was passed by Congress. This was indeed a "Limitation of Armament Act," not only of material, but of personnel, commissioned and otherwise. Apparently, Captain Tingey was legislated out of the Navy; but it would appear that he refused to leave. Anyway, he retained his position as superintendent during the period 1801-3, and in 1804 by special act of Congress, he was reinstated to his former rank and position in the Navy.

The year 1811 covered a period of great activity at the navy yard, in overhauling vessels preparatory to the War of 1812. The following ships were overhauled and reconditioned: *Vixen, Hornet, Enterprise, Wasp, Adams, Congress, Constellation, Constitution* and *Nautilus,* in addition to several gun boats.

Upon the occupation of Washington by British forces, Captain Tingey on the evening of August 24, 1814, in accordance with orders of the Secretary of the Navy, set fire to the navy yard and shipping. The yard was almost completely destroyed.

In reading the two reports of Captain Tingey relative to the firing of the navy yard, and damages resulting therefrom, it would appear that he carried out his orders with great reluctance, and only when informed of the complete rout of the American forces, and the near approach of the British. Mention is made in his

report of the disgusting actions of the "good Americans" residing in the vicinity. To quote from Captain Tingey's report:

> I had no sooner gone than such a scene of devastation and plunder by the people of the neighborhood took place in the houses as is disgraceful to relate. Not a movable article, from the cellars to the garrets, has been left us, and even some of the fixtures and the locks on the doors have been shamefully pillaged.

The capture of Washington and consequent destruction of public property deeply humiliated and exasperated the public mind, and as is usual, a great furore followed—including an investigation by Congress into the reason and authority for setting fire to the navy yard. As might be expected, much was said on both sides. As near as can be determined from the records available, it would appear that the decision to burn the yard was arrived at by the President and entire Cabinet at a meeting just prior to the entrance of the British into the city. In the natural course of events, the "buck was passed" in greater part, to Captain Tingey and the Secretary of the Navy, both of whom were thereafter the recipients of much adverse criticism.

Steps were now taken to rebuild the yard, which project was pushed to completion with energy and dispatch, and the usual routine of production continued. From this time on, the navy yard gradually ceased to be a building and repair yard for ships due to shallow water in the approaches and its long distance from the sea; in the early thirties the yards at Norfolk and New York had practically supplanted it in these respects.

Captain Tingey died on February 23, 1829, having been commandant of the yard continuously since 1800, and during the terms of six Presidents. The yard, under his administration, accomplished many wonderful things, and its condition at that time was indeed a monument to his ability and devotion to duty. It is interesting to note that during his entire term of office all his official correspondence was executed in his own handwriting.

Mention is made at various times of a "laboratory" at the yard. As near as can be determined, its function was on the order of our present experimental ammunition unit at the Gun Factory, combined with the special board on naval ordnance. Shortly after Lieutenant Dahlgren came to the yard as head of the Ord-

nance Department, 1847, this laboratory became an important factor. Secretary Dobbins in his reports 1855-56 states:

> The experimental establishment at the Washington Navy Yard has been for many years an admirable adjunct to the Bureau. Having at its head an officer of high order of intellect and indefatigable energy, aided by a small corps of assistants, the Department has found it a shield of protection against the introduction of novelties of visionary inventors, . . .

Lieutenant Dahlgren remained at the navy yard as head of the Ordnance Department until the outbreak of the Civil War, at which time practically all the officers on duty at that station resigned and cast their lots with the Confederacy.

By a special act of Congress, August 2, 1861, Commander Dahlgren was made eligible to the office of commandant of the Washington Navy Yard, and was ordered to that duty. As regards this signal distinction, the historian states: "We consider this enactment one of the greatest honors ever conferred by Congress upon a naval officer." Followed a period of great activity at the yard in an endeavor to supply ordnance material and munitions. To show the difficulties of that day, a letter from Commander Dahlgren to the Department is quoted:

> At this period the number of light cannon that this Department can supply is about two rifled bronze guns per week, which is by no means what it should be or what can be attained. . . . I acknowledge the shortcomings of this Department, but, in justice to myself, must say that they are not attributable to myself but to the miserable short-sighted policy that has been permitted to control the navy ordnance for more than ten years, and has overridden me in all the suggestions I have submitted. Some of these have been absolutely ignored or rejected, such as *experiments on armor for ships* in 1852; *rifled cannon* in 1856. I was powerless. . . . I am naturally discouraged by this constant difficulty which has only taken different forms under different chiefs without losing force or direction. . . . But I feel bound to state to the Department that without some change of system the ordnance of the Navy can never fulfil the wants of the service.

On July 23, 1862, Commander Dahlgren was appointed Chief of Bureau of Ordnance. Great improvements in ordnance, and increased production are noted in his régime. The Secretary of the Navy in his report of December 1, 1862, states:

> The improvements in ordnance at this yard under the skillful officer who has given it his special attention, and whose abilities in that capacity

caused him to be detached from active duties afloat, and whose great service led him to be placed at the head of the Bureau of Ordnance, have elevated the standard of ordnance in the Navy. Our ordnance is greatly improved, and improving.

About this time, there was a division of the yard into two parts: viz., ordnance yard, and navy yard. Secretary Gideon Welles in his annual report for the year 1863 states in part:

> The necessity for its extension is greatly increasing, and since the recent division of the yard into an ordnance and navy yard proper . . . there should be room enough in the ordnance yard for all ordnance purposes. . . .
>
> It is evident that the two yards and their accommodations should be as distinct as their respective jurisdictions are, in order to avoid all unnecessary collision, whether on account of accommodations for officers or points of duty. It is believed that the interests of the service will be greatly promoted . . . by the division of the two commands, so as to make them separate and distinct—one as a navy yard for ordinary purposes and the other as an ordnance yard exclusively devoted to the manufacture and preparation of articles coming under the cognizance of the Ordnance Department.

So far as known, the two sections of the yard continued under the command of the commandant.

The navy yard continued to decline in importance, but the ordnance yard to the contrary, and in spite of the many vicissitudes, mostly unfavorable, nearly held its own, and at times made rapid advancement, giving promise of taking rank as a first class ordnance factory.

The inception of the Naval Gun Factory might be said to have taken place on April 2, 1883, when the President appointed a "Gun Foundry Board," consisting of army and navy officers. This board visited the navy yards and ordnance factories of Europe, and upon returning to Washington, made recommendations in detail, "for the establishment of two government gun factories, one for the Army and one for the Navy, for the manufacture of heavy ordnance adapted to modern warfare," for the use of the Army and Navy; the one for the Navy to be at the Washington Navy Yard.

Despite the importunings of Secretary Chandler, Congress, while favorably considering the board's report, neglected to make appropriations necessary to carry out the recommendations contained therein.

In 1885, Congress, under the pressure of public sentiment, seemed to realize the helpless condition of the nation in the event of war, went to work in earnest, and seemed disposed to appropriate funds required for any legitimate purpose toward the "construction of a new Navy, composed of ships of war not inferior to those of other civilized nations," and for supplying these vessels with armor and armament in keeping, from our own factories.

The Washington Navy Yard from this time to the present, has retained about the same status: viz., a naval station. The usual yard craft and river transportation come under the navy yard; also the U. S. S. *Sylph* (assigned to the Secretary of the Navy) the commanding officer of which is considered as being attached to the navy yard.

The U. S. S. *Mayflower* berths at the navy yard, but neither the ship nor personnel have any connection whatever with the yard.

The following serious and frivolous facts which have bearing on the yard and which may be of interest, were noted in collating data for this manuscript.

1812. August 6. Mr. John Eliason, of Georgetown, sold to the yard for navy use, 120 barrels of "good whisky" at fifty-two cents per gallon.

1814. Pistols were manufactured at the navy yard. The blacksmiths employed at the yard sent a formal complaint to the Secretary of the Navy in effect "that they were not allowed refreshments while engaged in heavy work."
The commandant's endorsement follows: "If such an indulgence is necessary, the liquor may be brought into the yard at bell-ringing."

1818. Started manufacture of chain cables at the navy yard. (These seem to have been the first used in the Navy.)

1819. September 7. The frigate *Columbus* was commissioned. Her engines complete were manufactured by Robert McQueen & Co., at a cost of $43,000.00. Copper for her boiler was purchased by contract at ten cents per pound.

1826. May 27. The crews of all vessels of the U. S. Government were ordered vaccinated. (Smallpox being prevalent at that time.)

1829. The strategists of that day remark: "That the places of general rendezvous in peace and war should be the Chesapeake Bay and the waters at or near Newport."

1842. Thermo-tension treatment given chain cables. Estimated to increase strength seventeen per cent.

1845. August 2. President Polk and entire Cabinet visited the yard. Apparently the first time visited by a President.

1849. Lieutenant E. C. Page, under authority of the Navy Department, was engaged in constructing at the yard a machine by which he proposed to produce rapid locomotion by "electric magnetic motor power."

1856. Boiler and entire machinery for U. S. S. *Minnesota* built at yard. (This was considered quite an accomplishment at that time.)

1857. Institution of gunnery practice in the Navy. Commander Dahlgren was placed in command of a vessel "to be devoted exclusively to gunnery practice, with a view to training both officers and men in a duty which constitutes real effectiveness of a man-of-war."

1861. First Regiment New York Volunteers, Colonel Vosburgh, ordered to the navy yard for its protection.

Re "persons of color." "The Department . . .. authorizes you when their services can be made useful . . . to enlist them for the naval service. . . . They will be allowed, however, no higher rating than 'boys' at a compensation of $3.00 per month and one ration."

1865. Remains of the "assassin" Booth, placed on board the ironclad *Montauk*, at the yard. Other persons implicated in the assassination of President Lincoln were imprisoned at the yard.

1877. Ship ventilation apparatus, constructed at the yard on plans of Acting Assistant Surgeon Owens, was given trial on U. S. S. *Tallapoosa*. Board reported: ". . . performed work thoroughly and more satisfactorily than any other known to the service."

Organization—The title of the administrative head of the Washington Navy Yard is: "Commandant of the Navy Yard and Superintendent of the Naval Gun Factory."

Coming under the military jurisdiction of the commandant, and contained within the navy yard proper, are the following:

1. Naval Gun Factory.
2. Receiving Barracks and Seamen Gunners' School.
3. Marine Barracks.
4. Wind Tunnel.
5. Model Basin.
6. Radio and Fire Control Laboratory.

The following outlying stations are also under the jurisdiction of the commandant:

1. Naval Hospital, Washington, D. C.
2. Naval Air Station, Anacostia, D. C.
3. Aircraft Radio Laboratory, Anacostia, D. C.
4. Naval Torpedo Station, Alexandria, Va.
5. Naval Magazine, Bellevue, D. C.

The cognizance of the above stations and plants comes under the various bureaus of the Navy Department in the same manner as do similar departments in any navy yard.

We shall now restrict ourselves to the Naval Gun Factory proper.

II. The Naval Gun Factory

Establishment and Expansion—The Naval Gun Factory was established on October 1, 1886, by Secretary Whitney's General Order No. 354 of August 14, 1886:

> The demand for increased facilities for constructing the batteries for the armament of additional ships of war, which Congress has now provided for, makes it necessary to reassign the shops and buildings of the Washington Navy Yard. All the shops, machinery, tools and appliances assigned for the use of the Bureaus of Construction and Repair, Steam Engineering, Yards and Docks, and Equipment and Recruiting will therefore be turned over to the control of the Bureau of Ordnance and the quarters now occupied by the representatives of the above named bureaus, will be vacated on October 1, 1886.
>
> William C. Whitney.

Secretary Whitney's intention was: "To build in the Washington Yard an ordnance factory equal to the demands of the times, and capable of supplying our new ships of war with guns, which, in power and efficiency, will at least be equal to those of other advanced nations."

Funds having been appropriated by Congress, the construction of the gun shop and shrinkage pit was started and the work expedited. The gun shop was designed and constructed with a view to having capacity for the construction of guns 6-inch to 16-inch caliber. The 16-inch guns were, as designed in those days, forty-seven feet long, weighing 110 tons.

The gun shop, when completed, was to occupy three sides of a rectangle, 600 feet long by 390 feet wide, with an enclosed court in which the power plant was to be located. One shrinking pit was provided for, this pit to be sixteen feet in diameter and eighteen feet deep, fitted with horizontal reheating furnaces. The wings of the building were fitted for the manufacture of small caliber guns, gun carriages, other ordnance appurtenances and the fitting of projectiles. The cost of the entire gun plant and equipment was estimated to be $1,625,000.

The Secretary of the Navy in his annual report of 1892 states: "The Gun Plant at the Washington Navy Yard is the foremost of its kind in the country, both in administration and material." Other authorities of that date conceded it to be one of the finest in the world.

It is interesting to note at this point that up to and including the year 1890, all proof firing of guns and powder was done from emplacements along the sea wall at the navy yard. From this time on, the Gun Factory enjoyed a rather healthy growth, new buildings and modern equipment being added from time to time to keep pace with improvements in ordnance design and manufacturing practices. This continued after a fashion until along about 1910, when, due to small building programs, the gun shop facilities began to border on the obsolete. The early years of the World War found the Gun Factory to be far from capable of meeting the "demands of the times." The majority of the shops, being of old type construction, did not lend themselves to modernization and expansion along scientific lines, so in order to meet the demands of the 1917-19 programs, it became necessary to extend the yard by purchase of land on both the east and west ends, and practically build anew. In the meantime, since the new construction did not interfere with production, the available facilities were worked at capacity.

Follows a list of new shops which were constructed during the period of 1917-19, together with a brief description and a very general estimate[1] of the capacity of each. (The many additions and improvements to old shops are not included.) It is unnecessary to state that in all the new construction, the buildings, equipment, appurtenances and facilities are the latest in scientific attainment, and of the best quality obtainable. The cost of equipment is noted in the case of some of the shops in order to give a general idea as to completeness and magnitude.

(a) *Gun Shop No. 2.* Devoted exclusively to the manufacture of guns; shop and equipment designed for the manufacture of guns to and including 16-inch, 50-caliber. Cost of building and shrinkage pits, $1,206,060. Capacity: About twenty-five major caliber guns per year, after completion of first gun, in

[1] NOTE: All estimates given as to capacity are, intentionally, only generally accurate due to their confidential nature.

addition to minor caliber guns. The routine work of relining guns will not interfere with production. (Approximately ten months would be required for first gun.)

(b) *Machine Shop.* First Floor: Torpedo tube shop; for the manufacture of torpedo tubes and torpedo bodies. Cost of equipment $400,000. Second Floor: Miscellaneous shop; as name implies, fitted for miscellaneous machine work, and manufacture of fire control material. Equipment, $385,000. Third Floor: Tool shop; manufactures all tools, jigs and gauges used in the Gun Factory, and in addition, keeps same in good condition at all times. Fourth Floor: Sight shop; manufactures everything pertaining to sights, exclusive of purely optical material. Equipment, $801,000. Fifth Floor: Torpedo shop; manufactures torpedo parts exclusively. Cost of equipment $308,000. Capacity estimated at 325 torpedoes per annum. (This shop is now closed.)

(c) *Pattern and Woodworking Shop.* Woodworking shop on first floor; pattern shop on the second floor; third and fourth floors are used for stowage of patterns. All ordnance patterns are made at the Gun Factory. In case contract is let to commercial firms for castings, the Gun Factory furnishes all patterns Cost of equipment $127,000.

(d) *Brass Foundry.* For casting all non-ferrous metals. Capacity equal to requirements of the Gun Factory.

(e) *Optical Shop and Range Finder Testing Tower.* The optical shop is equipped for the manufacture and overhaul of all optical material for the Navy. The range finder testing tower, sixty feet long by thirty-four feet wide, six stories in height, immediately adjoins the optical shop, but is not structurally connected in order to reduce chance of vibration to a minimum. The purpose of the tower is for the overhaul, assembly and test of range finders. Landmarks at various accurately computed ranges are used for calibration purposes.

(f) *Mine Building.* A laboratory for research development and experiments on mines. Connected with the mine building is a cylindrical test tank, sixty feet deep and twenty-five feet in diameter. Filtered water is used so that the action of the mine and mechanism may be observed through glass ports at varying depths; service conditions are simulated in dropping mine.

. The experimental ammunition unit is housed in the Mine Build-

ing. This unit has to do principally with research and experimental work as regards fuzes, bombs and igniters.

(g) *Proof Shop.* Prepares broadside guns for proof, and overhaul after proof. To overhaul and prepare for store, or survey, all ordnance material coming into the Gun Factory for store or other purposes.

Gun forgings for guns of 8-inch caliber and above, are procured from sources outside the Gun Factory. Large castings, such as a slide for 12-inch gun or larger caliber are also procured from outside sources, usually commercial firms. Other forgings and castings are, in the main, manufactured at the Gun Factory.

Present Status—The present day status of the Naval Gun Factory, in brief, is: a government plant, under the cognizance and direction of the Bureau of Ordnance, for the development, test, manufacture and supply of offensive and defensive naval ordnance, ordnance appurtenances and spare parts, for ships of the naval service. It is now equipped to "meet the needs of the times," but the Treaty for Limitation of Armaments almost caused the closing of its doors; as a matter of fact when the Conference on Limitations met, the work ordered held up at that time did cause the suspension of all work in several shops.

Unless one stops to analyze the situation, I do not believe that there are many who realize the extent and magnitude of the work in progress at the Gun Factory at that time or the great effect of its immediate discontinuation on that plant. There was no notice given, no tapering off, no opportunity for readjustment to meet the situation; merely a peremptory order to stop immediately and for an indefinite period, all work in progress on the 1917-19 program.

I should like to say at this point that there are many who, without realizing it, look upon the Gun Factory as being merely, as its name implies, a factory for the manufacture of guns. *The manufacture of guns alone is the least part of the activities at the Gun Factory.*

This program, as is well known, called for four 16-inch, 45-caliber ships, mounting eight guns each; six 6-inch, 50-caliber ships, mounting twelve guns each; six battle cruisers mounting eight 16-inch, 50-caliber guns each—a total of forty-one 16-

inch, 45-caliber, and one hundred fifty-one 16-inch, 50-caliber guns, replacement battery of each caliber included. Approximately one third of those guns were being manufactured on contract at Midvale, Bethlehem and Watervliet Arsenals; the remainder at the Gun Factory.[2]

The Gun Factory was manufacturing for *every one of these guns* the following: breech mechanism complete; slide; yoke; deck lugs; gas ejector system; sights; elevating gun attachments —together with the thousand and one details necessary for the mounting and handling of these guns in their turrets. In addition, the powder and shell hoists, spare parts—everything in fact except the speed gears,—for turrets, guns and hoists.

Now add to the above the secondary batteries complete, consisting of a total of about two hundred twenty-five 6-inch, 53-caliber guns, together with their mounting and appurtenances; anti-aircraft batteries; torpedo tubes and torpedoes; fire control gear and many of the instruments for main, secondary and anti-aircraft battery, fire control systems; airplane catapults; drill guns; dummy and drill ammunition; spare parts and so on, *ad infinitum*.

All was stopped. Work was left in the lathes; units left partially assembled; a vast quiet prevailed; the employees who remained after the wholesale furlough conversed in low tones not knowing when their turn should come. It was as though some mighty power had stayed the hands that had so lovingly wrought the metals into the completed units. As one gazes upon the uncompleted guns and appurtenances lying about the yard, inert masses of iron and steel, mute evidence of the mastery of the seas which we voluntarily relinquished, in which can be visualized the life, power and awe inspiring beauty of proud ships in action for our country's cause, one cannot have the spirit of the service but that his eyes grow misty and a lump rise in his throat.

At present, the Gun Factory is engaged in what might be termed routine work: viz., relining guns for regunning ships of the fleet; supplying spare parts and accessories; manufacture and supply of improved units and parts for existing installations. In addition: the completion of ordnance outfits for scout cruisers,

[2] Note: At time noted, the three vessels retained were practically completed so far as the Gun Factory was concerned.

and the prosecution of the program for airplane carriers—8-inch guns and mounts with all accessories.

The Gun Factory is equipped, strictly speaking, for the manufacture of ordnance only, as specified in the opening paragraph, but at times it becomes necessary, due to lack of work and a desire to retain the highly skilled employees, to undertake contracts for other government departments. To obtain this work for the Gun Factory, it is necessary to compete with civilian contractors. In bidding for these outside contracts the comparatively large cost of jigs, gauges and fixtures necessary for the fabrication of "alien" products, is naturally added to the cost of production. In spite of this fact, however, the bids offered by the Gun Factory are, in many cases, considerably below those of the nearest competitor.

One contract in particular, in which the product requested was in no way akin to ordnance material, was undertaken by the Gun Factory. This contract called for ten thousand mail boxes of various types for the Post Office Department. The despatch with which the highly skilled, precise workmen, accustomed to working to tolerances one tenth the thickness of a cigarette paper, turned out this comparatively crude product, was, to say the least, gratifying.

Mission—Everything must have a mission—else there is no reason for its existing. As concisely as can be stated, the mission of the Naval Gun Factory is: To equip the Navy with ordnance and ordnance installations, offensive and defensive which, in simplicity, accuracy, reliability, durability and effectiveness, shall be at least equal, and if possible superior, to those of any other nation. For the purpose of this article, the general plan of the Gun Factory, in its endeavor to carry out its mission, has already been described sufficiently in these pages. It is left for the service to judge whether or not the Gun Factory is accomplishing its mission.

Personnel—During the rush days of 1917-18 there were 9,000 civilian employees at the Gun Factory. After the signing of the Armistice this force was cut practically in half and the work on the 1917-18 building program was continued in a more leisurely manner so that in the latter part of 1921 the Gun Factory force totalled about 5,000 employees. Then came the Treaty for the

Limitation of Armaments which was a staggering blow to the Gun Factory. On February 8, 1922, the Navy Department directed that all work on the 1917-19 building program be stopped immediately; men returned to work the following morning unaware of this sudden change of affairs; within twenty-four hours, 2,000 employees had been sent out of the Gun Factory on indefinite furlough.[3] Those remaining were the "old guard," the majority of whom had held supervisory positions during the preceding five years; many were demoted back to the benches and machines, with the attendant loss of pay and prestige; in spite of these adversities, it must be said to their credit that practically without exception they accepted this situation philosophically, and continued to produce.

In reading hundreds of pages of historical data, records, annual reports, etc., relative to the Gun Factory, covering a period of 125 years, one cannot but be impressed with the fact that loyalty, reliability and patriotism seem to have been inherent characteristics of the Gun Factory employees. During the Civil War, when General Jubal Early threatened Washington, volunteers from the Gun Factory were called for and they stepped forward to a man: 800 under command of the commandant, Admiral Goldsborough, were armed and sent into the trenches at Fort Lincoln (a few miles outside of Washington) to assist the Army in preventing the capture of Washington by the Confederates. The remaining employees were organized for the protection of the Gun Factory. The walls about still contain scars in evidence of loop holes, gun emplacements and other preparations of defense, memorials to the zeal and patriotism of the employees in times of stress and danger. The employees today, who started as apprentices at the Gun Factory, are the sons and grandsons of these same men.

Did you ever know of any person in the naval service who hesitated to climb into a turret or stand near a gun while firing; or did you ever stop to realize the implicit faith that you and every other person in the Navy have in Gun Factory products? It is the faith of a small boy in his father, but unlike the faith of the small boy, it is a faith that endures; an inborn service

[3] Note: Total employes in Gun Factory at present time—approximately 2,100.

faith which we all have. We know that our ordnance is as perfect as is possible for human ingenuity to devise and skill to fashion. The employees know of this great faith of the service and their endeavor is to retain it. They have the spirit, the true navy spirit, and they have pride in this service faith and in being a part of the Navy. Scarcely a flaw but their alert eyes will note and call to the attention of the supervisor or inspector. The idea of "getting by" or "putting things over" is not in the scheme of things at the Gun Factory. Since "man is prone to errors as the sparks to fly upward," inspection is considered necessary in order to prevent every possible chance of flaw or error in products leaving the Gun Factory for the service, since in time of war, the receipt of necessary parts containing flaws, or of an imperfect fit or type, by a ship in the war zone far from a base of supplies, might prove to be disastrous to the country's cause. For this and other serious reasons, every precaution is taken.

To the personnel of the Gun Factory is due the credit for the majority of the ideas and the development of all ideas for the improvement of naval ordnance; the men in the shops are thinkers as well as doers, and to them full credit is cordially given for the origination of ideas and their many valuable suggestions regarding improvements.

A few of the comparatively recent developments which stand out particularly, and with which all are undoubtedly familiar, which originated at the Gun Factory are: gas ejector systems; shell hoists; chain rammers; removable primer seats; down swinging type, and lever side swing (Mark II) breech mechanisms, together with many others which will not be mentioned. Suffice it to say, practically all foreign powers are using these improvements; some few are paying royalties—the majority simply adopted them.

ADULT OFFICER EDUCATION

By Commander Willis W. Bradley, Jr., U. S. Navy

THE education of an officer never ceases from the date of his first commission to the time of his retirement from active service. We know this to be so true that it hardly interests us; the bare fact that one keeps on acquiring knowledge all his life is so apparent that we need not concern ourselves with any argument in its support or with any probability of its denial.

The great things which do concern us all in this adult officer education are: What and how much is being learned, and are individual attainments being used and rewarded by the Navy?

On the subjects of seamanship, engineering, fire control, ordnance, and gunnery, there can be little question or argument. All line officers serving at sea (and to a certain extent those ashore) acquire more or less knowledge of some or all of these subjects as a supplement to that held at the time of their first commission. There is also no question but that the knowledge so acquired is applicable to the Navy, that it is somewhat reflected in the officers' fitness reports, and that it is used at times by the Department.

On such subjects as international law, military law, and languages, there is room for many questions and arguments. It is certain that the average line officer totally neglects subjects of this class, except when studying for examination, and that the only knowledge he has of them is what he learned at the Naval Academy or has since acquired while "boning" for examination or has absorbed by contact with such matters without any mental effort on his part.

The Postgraduate School offers instruction in technical branches to a certain limited and fortunate number of the line. The total number of officers who can receive such postgraduate instruction is so small as only to scratch the surface. A certain number of officers are educated in law but, except when in the office of the Judge Advocate General, they are completely lost from sight in

the great mass of the service personnel. The Naval War College offers many opportunities for both class and correspondence instruction, but even this does not begin to go around the entire service. The field covered by the correspondence course is very restricted and the time for actual attendance at the War College is too short for the accumulation of a very great amount of knowledge; a year of intensive study is a great help but one year is a very short span in an officer's active life.

You may say, "What is the remedy for this condition?" One answer is, "There is no complete remedy. Perfection in a great number of people cannot exist, but conditions may be greatly improved by encouraging adult education for all officers and by offering better facilities for such education along professional lines." "Such education would cost the Navy money, and money is hard to get." Quite true. It would cost some money—not much when considered in relation to the pay of the whole personnel—but enough to be mighty hard to get. However, Congress is usually very willing to listen to any reasonable scheme for education. Existing facilities might also be used to reduce the cost to a great degree. "Such education would require work and initiative on the part of many officers; not merely cursory work, but continued effort which would interfere with many pleasures and might not be popular." True again. To accomplish any great object there must be some reward in sight so far as the great mass of officers is concerned. It would be necessary to get interest by making officers believe that the results attained would be of some concrete individual benefit to the worker. It would be necessary to make good on the promise so implied; to spread very carefully upon an officer's record his individual accomplishments in self-education; to consider seriously these accomplishments both in making assignments to duty and in selection for promotion.

The average man (either in or out of the Navy) will not work for nothing. He will not put in long and tedious hours reading or translating, when he may be playing golf or bridge, unless he is convinced that it will benefit him in a material sense. The mere passion for education is sufficient to make some men study simply for the sake of knowledge but such a passion certainly does not control the average man. He reasons something like this: "This information might be of some use to me and it might not. I can afford to pass up any momentary satisfaction I might get at some

future time for the great satisfaction I am getting out of my life now. I don't see that selection amounts to much. If I keep a fair reputation and don't get my record all smeared up I am practically certain of selection, that is, if I can get high enough on the list even to be considered. If I can't get high enough on the list to be considered, what good will all this extra work and knowledge do me? The board doesn't go down and pick out officers because they are better than the ones ahead of them, if the higher ones have fair records and reputations. So I'll get all the amusement I can out of life. Life is short enough as it is."

To change such an attitude something definite in a material sense must be shown to be attainable, or at least more attainable, through work and study. Just about two years during which the selection board would pick and choose from among the first one hundred in a grade instead of from among the first fifteen would completely change this average man's aspect of affairs. The whole personnel would take notice and each would begin to ask wherein he could make himself more desirable and more valuable to the Navy and therefore more likely to be promoted. There would be an immediate attempt to show particular proficiency in hundreds of cases where "the easiest way" is now the rule.

Many of the great universities are now carrying out adult education by correspondence. They are carrying it out with such success that in many branches the credits issued for home work are accepted for entrance to the university or for degrees. The cost of such courses to the student is very small; so small, in fact, that in some cases the university loses money and receives reimbursement from the state in which it is situated. The state considers it a sound investment to pay out good money to improve the education of Tom, Dick, or Harry, who may be driving a truck or shoveling sand. How much more should the Navy consider it a sound investment to spend money to improve the education of the great bulk of its officers?

As a means for accomplishing this adult education the facilities now existing might well be employed in a great degree. For example: The War College could handle courses in international law; the Naval Academy courses in military law, languages, etc.; the Postgraduate School courses in engineering, ordnance and gunnery, and fire control. The method of handling such courses should be standardized by one controlling authority, possibly the

Postgraduate School or the Bureau of Navigation. Additional personnel might be needed in some cases, in others it might easily be possible to carry out a great deal of correspondence work with the existing personnel.

Class or individual instruction could be arranged for officers on duty in Washington and possibly for those on duty with the larger fleets at certain times. With the number of civilian professors on duty at the Naval Academy it would not seem impossible to arrange for some few of them to give instruction to enrolled officers at the Navy Department on Saturday of each week. If the Navy Department could not handle the necessary expenses, such expense as would be necessary would undoubtedly be borne gladly by the students themselves. With two students each hour, it is probable that it would cost each student from twenty-five to fifty cents instead of the one dollar and a half for each half hour instruction now necessary to obtain equally good teaching in a private school. This is merely given as an example. The entire field would seem to be broad in many directions and to have almost unlimited possibilities.

The Marine Corps has found it advisable to require certain of its officers to take specified courses of instruction. Would it not be a good rule to inaugurate some such system in the Navy? It has been proposed many times that the War College course be made an essential for high command but this proposal has always been abandoned because of the manifest difficulty of giving every officer a chance to go to the War College. The same objection cannot be raised against correspondence instruction. Every officer can make the time for such work without any great hardship.

The encouragement or the requirement of supervised adult education among commissioned officers would not necessarily make excellent officers out of poor material but it would unquestionably raise the average intelligence and ability of the officers taken as a whole.

The saying "Knowledge is power" is exceedingly applicable to a body of educated men such as make up the officers of the Navy. The real question is, "How shall we increase the standard of pertinent knowledge among naval officers?" A reasonable answer is, "By offering suitable opportunities and conveniences for acquiring such knowledge and by making the acquisition thereof a heavy factor in assignments to duty and in selection for promotion."

DISCUSSION

See Training of Marine Officers

(See page 935, June, 1924, PROCEEDINGS)

Introduction

REAR ADMIRAL W. V. PRATT, U. S. NAVY:—I am greatly pleased to have been asked to discuss an article just published in the Naval Institute PROCEEDINGS entitled, "Sea Training of Marine Officers." There have been so many differing views on this subject that it is one about which the service might give some thought. The Marine Corps is the oldest service. It came into being to serve a dual purpose. In a way it is a survival of the times when seamen sailed the ships and soldiers manned the guns. In our own times we have seen the value of a land organization trained to adapt itself to life at sea so as readily and quickly to adjust itself to any conditions which it may encounter if landed on foreign soil. In fact, it is one land force which may be landed on soil at a moment's notice for the purpose of protecting life and national interest without involving us in grave danger of violating certain state rights.

Certain Naval Points of View

There was at one time a current of opinion held by some able naval men that the marine had no place in ship life. Very possibly the basis of this opinion lay in the fact that the marine aboard ship was looked upon simply and solely as a member of the police force. Those who held this point of view naturally could see no advantage in having a body of men added to the working sea force of a ship for police work only.

On the other hand a great majority of naval men have been of the opinion that the marine aboard ship had a very definite function to perform, additional to that given him as a member of a police force. It is useless to attempt to record the various incidents in our naval history where the opinions of those holding the latter point of view have been fully substantiated.

Certain Marine Points of View

On the other hand among the marines themselves there appear to be some who believe that the purpose of the marine at sea should be limited to his functions as a member of an expeditionary force when occasion for the use of such force is required. The late war has given quite an impetus to this point of view but it is unsafe practice to base opinion entirely upon the lessons learned from one recent war. Those who hold to the point of view that the function of the marine at sea is limited to his duties as a member of the expeditionary force must, in the back of their minds,

believe that the marine is more of a soldier than he is a sailor. Were he to train continuously with this point of view dominating, the result would be that inevitably the marine would become a soldier. He would forget the purpose for which his corps came into being and the opportunities for coming into contact with the sea side of his profession and for the exercise of the duties which he may learn only at sea would be so small that in time this side of his profession would be obliterated.

Need for Co-operation and Understanding

Without doubt the most efficient body of men that can be landed on shore quickly to meet an emergency are the marines. They specialize in this work and in it there are none better. But to gain and to keep them in close touch with the sea, which is necessary in order that marines and sailors alike may learn to know and to understand each other, they must be thrown together; they must mess and live with each other; they must share the same living conditions, otherwise they grow apart. There is reason, then, that aside from the training which the marine receives as the member of a large expeditionary force, he should receive the training which comes to every man who follows the sea and he should share in the everyday working life. It has been the custom in the modern battleship to give marines definite gun stations. It has worked to advantage, and of late years, there has been apparently little objection on the part of the old sea dogs to this procedure. Indeed, there seems no good reason why junior marine officers, while on board ship, should not receive the same training that the junior naval officer receives, in matters of watch standing, deck duty, and gunnery training. At least, this would have a tendency to bring junior naval officers and junior marine officers more in touch with the working life of each other while at sea.

A Desirable Training Base

There exists at Quantico a most excellent training base for the purpose for which it was intended. At San Diego there is the location for another base. Whether this should be as complete as the station at Quantico is a matter of opinion, but so long as the battle fleet stays in the Pacific there may be need for a training base to fit junior marine officers for their duties in the fleet. Certainly, San Diego is a spot of great strategic interest.

Final

Instead of separation between the Marine Corps and the naval service to any greater extent than exists today, there should be, if anything, a greater spirit of co-operation. The Navy has need of an efficient Marine Corps. On the other hand, were the marines to separate themselves from the Navy, ultimately they would be swallowed in the Army, and that most valuable body of men, able to fight on land and to find themselves at sea, would disappear from the list of our military forces.

Report on the Fitness of Officers

(See page 214, February, 1924, PROCEEDINGS)

COMMANDER J. P. JACKSON, U. S. NAVY:—Commander Richardson's criticism of the present Fitness Report is well founded. I believe that many officers feel the same way about it. Few reporting seniors desire to give an officer an unfavorable report, and therefore mark officers "average" who they really feel are "below average." Also, to make a distinction between these officers and those who reporting seniors feel are somewhat better, the tendency is to mark the latter "above average," although as a matter of fact they may be only good average officers.

The result is that if any large number of reports of fitness on file in the Department were taken at random, it would be found that the marks averaged "above average," which is clearly impossible, as Commander Richardson points out. The word "average," as regards the qualifications of officers shown by their fitness reports, thus loses its significance and becomes a meaningless term, or rather a term to denote the qualifications of an officer just good enough not to get unfavorable reports.

All of this is due to one short sentence on the present fitness form: to wit, the last sentence under Item 10, which reads, "A mark below average will be considered unfavorable."

Why should it be considered unfavorable? Whatever marks reporting officers give, we cannot close our eyes to the fact that if the term "average" means anything, the majority of the officers in the service are "average," and if the number of officers who rank as "superior" and "inferior" is, as we know, small, there will be as many officers "below average" as there are "above average."

This does not imply by any means that officers who are "below average" in some respects are worthless, or even deserving of unfavorable reports. The number of qualities in which officers are marked covers a wide range, and it would be surprising indeed if many officers who were "average" or "above average" or even "superior" in most respects did not fall "below average" in some one of the nineteen qualifications; and yet that officer who is satisfactory in eighteen of the qualifications but slightly "below average" in one would, if he were correctly marked, get an unfavorable report.

If the present form is to be retained, I certainly agree with Commander Richardson that the last sentence of Item 10 should be stricken out and reporting officers given an opportunity of stating their frank and honest estimate of their subordinates' qualifications without wounding the sensibilities of those slightly below average, and being required to enter into an official controversy with a subordinate regarding the justness of the mark.

All reports upon subordinates are, of course, based upon the judgment and opinion of the reporting senior. If the latter is deemed competent to make report, why should he be put into the position of having his

judgment or justice questioned, and be put upon the defensive as it were, by the "come back" of the officer reported upon. In addition to wounding the sensibilities of the officers concerned, the effect of this practice is to discourage officers who have justly been rated "below average," create a feeling of tension between them and their superior, and thereby impair their value to the service as long as they serve under that superior.

As regards showing reports to officers whether unfavorable or not, which Commander Richardson advocates, I am not too sure of the advisability of this. Instructions were at one time in effect that this should be done. I do not, however, remember being shown one of my reports, and I do not believe it was generally complied with. This practice also would savor somewhat of putting the reporting officer on the defensive as to the marks he had given and of subjecting his action to the close scrutiny of his subordinates. I can conceive that it might, on some occasion, invite actual protest from an officer reported on who felt he had not been marked as highly as he considered that he deserved in some qualification. Officers' records are always accessible to them for inspection at the Department where they can review them at their leisure without causing possible embarrassment to the reporting senior.

Commander Richardson's suggestion of changing the Regulations to permit comment on any portion of the report which *is considered* unfavorable or *unjust* is a direct imputation against the reporting officer, and an invitation to juniors to "buck" their superiors which would tend to undermine discipline and encourage insubordination. Distinctly unfavorable reports (not including marks "below average") can still be referred to subordinate comment, as at present required; but further than this I would not go.

Reporting the names of books or professional subjects read would not, I believe, accomplish any useful purpose. Some such question used to be on the old fitness form. The tendency would be for young officers to pad their lists by putting down every book through which they had glanced or whose cover they had opened, whether or not they had really studied and digested the contents.

I agree in the main with Commander Richardson's suggestions for substitutions in the list of qualifications reported on. I consider "energy" however, a distinct and valuable attribute not covered by "devotion to duty" nor "industry." It implies "activity" which the others do not, and I believe it should be retained on the form, but separated from "endurance," for the reasons given by Commander Richardson.

For "education" I would substitute "mental ability" or "mentality," which is not covered even remotely by any qualification now on the form. To my mind it is a qualification of major importance upon which officers should be rated. I agree entirely with Commander Richardson's comments on "tact" and its importance, and believe it should be added to the present list as an additional qualification to be reported on.

Near the beginning of this discussion, I used the words "if the present

form is to be retained. . . ." When all is said and done, is it satisfactory? I do not think so. In fact, in some ways I think the old form is better. By marking an officer "excellent," "very good," "good," "fair," and "poor" there is no question involved of a fictitious *average* in comparison with others, but a clear-cut, flat statement of that officer's *absolute* worth.

By appending a definite mark on the scale of four as formerly done, much greater flexibility is possible in grading officers than is secured by the present method of grouping them in five classes, three of which in practice are the only ones usually employed. The objection which may be made, that some reporting seniors are notably high or low markers, is equally applicable to the present method; and it is contended that by averaging the marks on the scale of four of several reporting seniors, a much closer estimate of an officer's actual grading can be made than by a similar averaging of the present form.

It is therefore thought that the present fitness form can be much improved by:

1. Revising from the old and new forms, with such additions and substitutions as may seem desirable, the present list of qualifications upon which officers are marked.

2. Abolishing the "average" method of marking and substituting the old positive system, including definite marks in each qualification, on the scale of four.

3. Not considering a report "unfavorable" unless it contains a mark of "inferior" or "poor."

Control of The Air

(See pages 341 and 389, March, 1924, PROCEEDINGS)

LIEUTENANT F. P. SHERMAN, U. S. NAVY:—The phrase, "Control of the Air," has been used frequently of late and has been misused almost as frequently. There appears to be a widespread impression that control of the air is an impossibility since the speed and climb of aircraft make it impossible to prevent enemy planes from passing through an air area in view of the range of altitude available, and that such control would necessitate keeping enormous numbers of aircraft actually in the air.

Control of the air does not imply the power absolutely to deny flight to enemy planes any more than control or command of the sea implies the power absolutely to prevent the passage of enemy ships. It is a very real and a very important consideration in naval warfare which can be defined as follows in language analogous to the usual definition for command of the sea:

The control of air over a certain area rests with the air force which can secure and exercise control at will. To secure the control of the air is to defeat the enemy air force in that area or to effect such a disposition of forces that enemy air forces can not interfere with our aerial operations or initiate important aerial operations of their own without the probability

of decisive defeat. To exercise the control of an air area is to carry on those operations which are possible only where local control has been secured such as spotting, continued observation, bombing and torpedo attacks.

To secure control of the air over a sea area it is necessary:

1. To locate all enemy carriers which are in a position to launch aircraft which may in any way dispute our control of the air.

2. To attack and destroy the effectiveness of such carriers by heavy bombing and torpedo attacks against the carriers themselves and by light bombing, incendiary, and gas attacks against flying-off decks and planes and personnel thereon.

3. To maintain either in the air or in readiness for flight sufficient fighting planes to defeat any air forces which the enemy can later bring into action.

The fleet, which in the early stages of an engagement secures control of the air as defined above, will find itself with the enormous advantages of aircraft spotting, the ability to use aircraft in smoke tactics, and the ability fully to utilize offensive aviation at will in bombing, torpedo, and gas attacks against the enemy battle line.

Rear Admiral Charles Wilkes and His Exploits

(See page 405, March, 1924, PROCEEDINGS)

EDWIN SWIFT BALCH:—In the interesting article "Rear Admiral Charles Wilkes and his Exploits," published in the March number of the United States Naval Institute PROCEEDINGS, the author quotes with approval my verdict in regard to Admiral Wilkes' Antarctic cruise, and for this I am duly grateful. Farther on, however, she speaks of the illegality of the seizure of Mason and Slidell from the *Trent* and says that "Captain Wilkes' act was in violation of the principle which led the United States to declare war against England in 1812." This, of course, is the view of the case usually accepted by historians, and it should therefore be of interest to navy men to know what the leading British statesmen thought at the time of the capture, and this is revealed in two letters of Lord Palmerston.

The first of these letters will be found in *John Thadeus Delane, Editor of The Times, His Life and Correspondence,* by Arthur Irwin Dasent, 1908, Vol. II, p. 36, and is as follows:

"Lord Palmerston to J. T. Delane

"94 Piccadilly

"November 11, 1861.

"*My dear Delane:*

"It may be useful to you to know that the Chancellor, Dr. Lushington, the three Law Officers, Sir G. Grey, the Duke of Somerset, and myself, met at the Treasury today to consider what we could properly do about the American cruiser come, no doubt, to search the West Indian packet supposed to be bringing the two Southern envoys; and, much to my regret, it appeared that, according to the principles of international law

laid down in our courts by Lord Stowell, and practiced and enforced by us, a belligerent has a right to stop and search any neutral not being a ship of war, and being found on the high seas and being suspected of carrying enemy's dispatches; and that consequently the American cruiser might, by our own principles of international law, stop the West Indian packet, search her, and if the Southern men and their despatches and credentials were found on board, either take them out, or seize the packet and carry her back to New York for trial. Such being the opinion of our men learned in the law, we have determined to do no more than to order the *Phaeton* frigate to drop down to Yarmouth Roads and watch the proceedings of the American within our three-mile limit of territorial jurisdiction, and to prevent her from exercising within that limit those rights which we cannot dispute as belonging to her beyond that limit.

"x x x

"PALMERSTON."

The second of these letters will be found in *The Letters of Queen Victoria*, Edited by Arthur Christopher Benson and Viscount Esher, 1907, Vol. III, pp. 593, 594, and is as follows:

"Viscount Palmerston to Queen Victoria

"Downing Street, 13th November, 1861.

"x x x

"Viscount Palmerston had on Monday a meeting at the Treasury of the Chancellor, Doctor Lushington, the three Law Officers, the Duke of Somerset, Sir George Grey, and Mr. Hammond. The result of their deliberation was that, according to the Law of Nations, as laid down by Lord Stowell, and practiced and enforced by England in the war with France, the Northern Union being a belligerent is entitled by its ships of war to stop and search any neutral Merchantman, and the West Indian Packet is such; to search her if there is reasonable suspicion that she is carrying enemy's despatches, and if such are found on board to take her to a port of the belligerent, and there to proceed against her for condemnation. Such being ruled to be the law, the only thing that could be done was to order the *Phaeton* frigate to drop down to Yarmouth Roads from Portsmouth, and to see that she did not exercise this belligerent right within the three-mile limit of British Jurisdiction and this was done. But Viscount Palmerston sent yesterday for Mr. Adams to ask him about this matter, and to represent to him how unwise it would be to create irritation in this country merely for the sake of preventing the landing of Mr. Slidell, whose presence here would have no more effect on the policy of your Majesty with regard to America than the presence of the three other Southern Deputies who have been here for many months."

It is evident from these letters that Lord Palmerston and his legal advisers looked on Wilkes' act as legally justified. Palmerston's efforts

to have the matter adjusted equally evidently were based, at least at first, not on legal grounds but on political ones, namely fear of international complications. And it is to be hoped that, just as Mawson's expedition forced hostile geographers to recognize Wilkes' discoveries in the Antarctic, in due time these letters of Palmerston will force historians to recognize that Wilkes showed exactly the same knowledge of international law about capture at sea as did Lord Stowell, Lord Palmerston and the legal advisers of the British Crown.

Tactical Employment of Aircraft

(See page 341, March, 1924, PROCEEDINGS)

SIDNEY BALLOU:—Recent writers in the Naval Institute PROCEEDINGS have emphasized the use of bombing planes in connection with fleet action. I wish to advance for discussion the proposition almost opposite: viz., the bombing plane is the proper arm of the inferior fleet. The superior naval force should carry no bombers whatever.

A superior naval force carries with it the practical certainty, born of centuries of experience, that, pitted against an inferior surface fleet it will ultimately obtain command of the sea. All it needs today is assurance that it will not be interfered with from the air, that is, by enemy bombers. Its restricted aircraft carrier capacity can be devoted to no better purpose than to obtaining this assurance, leaving the decisive blow to be delivered by the primary offensive weapon, the big gun of the battleship.

If organized strictly upon this principle the superior fleet can start with a comfortable degree of assurance that it will be unmolested from the air. It must be assumed that its aircraft carrying capacity is at least equal to that of the inferior fleet, and that each will have to give the same space to the necessary scouting and observation planes. The remaining space, which with the enemy is devoted to bombers, with perhaps some protective pursuit planes, should on the superior fleet be filled with single-seaters, to the exclusion of all bombers. Not only, then, will that fleet have an equal number of fighting planes, but for every bomber carried by the enemy it can carry two smaller and faster pursuit planes to give a superiority of fighting force and to bring down the slower and relatively unwieldy bombers.

For every enemy bomber this number would be increased. A squadron of eight bombers, for example, would mean on the other side a reserve of some sixteen pursuit planes whose one object, as soon as the bombers took the air, would be to drive directly for that objective.

The argument is plausible that as offense is the object of weapons, aircraft carrier space devoted to protection is unduly negative and defensive. As an offensive weapon, however, the bombing plane carries only an insignificant fraction of the power of any surface ship. No bomber which can be stowed on a carrier will carry more than one torpedo or more than two bombs of a size that would do real damage

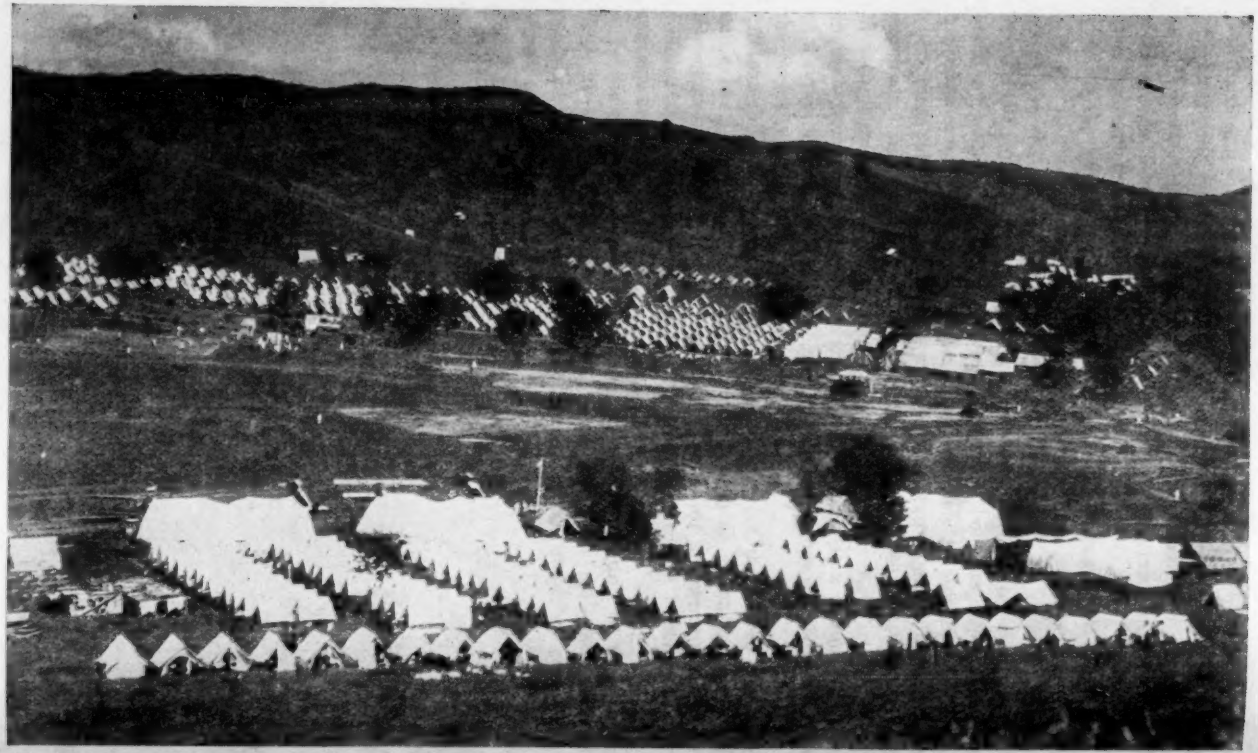
to a battleship. A couple of misses and the plane in all probability is out of the entire engagement. In bad weather it may never get in at all. It is carrying principle too far to add this fraction of offense to an already superior fleet at the expense of adequate insurance of the big guns against air attack.

With the inferior fleet the converse holds. Long as the chance is, it is one of those chances of inflicting damage on a superior force which should be pushed to the utmost. The commander of such an inferior force, however, should ask nothing better than that the opposing fleet had come out with an equality of pursuit planes and bombers rather than with a preponderance of fighting planes designed solely to stop his bombers.

In these observations complications have been avoided to emphasize essentials. In practice the aircraft equipment of a fleet must be modified in accordance with its particular mission. If, however, it is to seek the enemy's fleet near the enemy's own shores, which is a normal objective of a superior fleet, the danger of bombers coming from the shore increases the necessity of defensive pursuit planes.

Meanwhile, let us keep as far as possible from the theory that after battle has joined we would try to bomb the hostile aircraft carriers. If these carriers have delivered their load in a major engagement they have fulfilled their mission in life and the matter of a return ticket is of little consequence.

In the early days of torpedo boats, say about the time of the Spanish War, the chief effectiveness of the weapon lay in the state of mind produced on the enemy. Let us also get past this stage, as regards air attack, as soon as possible.



NAVY AIR FORCES ADVANCE BASE—WEST INDIES MANEUVERS

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER H. B. HIRD, U. S. NAVY

GENERAL ARRANGEMENT

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GREAT BRITAIN

Institution of Naval Architects

The Engineer, 11 April, 1924.—The annual meetings of the Institution of Naval Architects opened at the Royal United Service Institution on April 9, under the presidency of the Duke of Northumberland.

Admiral Sir Doveton Sturdee, who was warmly received, then presented a paper dealing with the "Strategical and Tactical Considerations Governing Warship Design." We give below an abridgement of it.

The well-recognized strength of the British Navy from 1815 until 1914 was a great asset in the preservation of the world peace, and ensured for this country naval peace for a century. This superiority we have, with our eyes open, abandoned in so far as battleships and aircraft carriers are concerned; therefore, strategically, we have placed ourselves at a disadvantage with any great Power that has an equal force of battleships, particularly if that Power is a continental nation and is self-contained, while we, with our communications to our Overseas Dominions, have some 80,000 miles of ocean routes to defend.

All indications seem to show that the gun will continue to maintain its pre-eminence over all other weapons of offense. It will continue to defeat at effective range any armor which it is possible to carry. Effective means have been devised to reduce ships' vulnerability from torpedo explosions, but to ensure protection from mines, external methods for sweeping mines from the path of the ship are still necessary; the paravane may not prove sufficient. Can means be adopted in the design to prevent heavy poisonous gases finding their way into the lower compartments of a ship? Might not the adoption of internal combustion engines be one solution for reducing this source of trouble?

With aircraft spotting, the gun range will be further increased, rendering protection from plunging fire still more imperative. It is hoped that more

thought is being given to the protection of the magazines from the flash from exploding shell and to more effectively breaking direct communication with the magazine. Let us hope that, with the chances of peace during the next century not being so rosy as in the previous hundred years, ships will be designed for one object: viz., to be most highly efficient for battle, all other thought being subservient to that one end. Rapidity of fire for competition in peace practice should never again be allowed to vitiate their efficiency for action with an equal or superior opponent. Experience in the war showed that bulges were very effective. They should be included in the design of all battleships and embodied so far as practicable in other classes. The increased safety obtained by having complete water-tight bulkheads, unpierced by doors, was fully demonstrated.

In accordance with the Washington Agreement, there will be no class of ship except the aircraft carrier between the 35,000-ton battleship, with its 16-inch guns and the 10,000-ton cruiser with its 8-inch guns. No limit of number has been assigned for the cruisers. They may become the most important class of ship; therefore too much attention cannot be given to their design. The late war only emphasized our previous war experience—the great need of cruisers and the varied services that they were called on to fill, such as to accompany battle fleets or squadrons, convoying duties, protection of trade routes, foreign stations, anti-submarine duties, etc.

The requirements for a british cruiser may be briefly summarized as follows:

(1) Sea-keeping is probably the most important; also to carry guns at such a height and manner that they can be used effectively in most weathers. The Battle of Coronel gave us a most painful experience, because this necessity had not been realized in some of our cruiser designs of the past.

(2) Steadiness of platform becomes of increasing importance with the increase of gun range.

(3) A good radius of action is essential.

(4) A higher maximum speed than that of possible enemy battleships.

(5) Good power.

(6) Vertical armor must be sacrificed in order to obtain as much horizontal armor as possible over the vital part and gun positions.

(7) Submerged torpedo tubes probably not being possible on such a limited tonnage, armored above-water tubes may be fitted in cruisers designed to accompany a fleet, but for other cruisers this weight might better be utilized.

(8) Each cruiser should carry and be able to launch two airplanes.

(9) Anti-air defense guns, particularly for cruisers intended to accompany battle fleets.

Battle fleets will no doubt have one or more aircraft carriers with them; therefore, the latter will require to have a speed equal to that of the fleet. Their large size should render them seaworthy.

Destroyers will be largely required for ocean work; therefore, ocean-keeping qualities will be essential. This will mean some increase in size, more attention being paid to the position and construction of the bridge. The number of times, even in North Sea waters, that either the fleet had to ease speed or the destroyers had to be detached, showed a need for better sea-going qualities. Possibly, in order to obtain these requirements in destroyers, they may become nearly as large as the present destroyer leaders.

Before considering the design or size of submarines, it would be wise to consider the policy we are going to adopt. Should we lead in the increase of size and power or follow other nations? Is it our best policy

to force the pace or await what other nations do? Is it not our true policy to follow, but not to lead, in this type of ship, but in the meantime not to neglect any opportunity to ensure that our war anchorages and ships are safe from their menace? If, however, other nations are determined to construct larger and more formidable submarines, we must reply to this threat to our internal communcations by building similar vessels. This will mean submarine cruisers—a type of vessel that requires deep water to operate in, and therefore suitable for ocean warfare.

The introduction of ocean submarines will necessitate some special form of submarine hunter—cruisers of superior gunfire to that of the submarine. The comparatively short-ranged guns our convoying cruisers were armed with in the late war will not now be sufficient.

To ensure the mobility of our ships, there must be ample docking facilities suitably placed on our main trade routes. The well-known loss of speed and excess of fuel expenditure, due to a foul bottom through lack of frequent cleaning, is another reason for these docking facilities. With the introduction of oil instead of coal, supplying ships at sea with fuel will be a future possibility. Oilers suitable for this purpose should be provided.

The late war showed that, so long as ships were under way, air attack is not serious, and there seems no reason to modify this experience. However, defense from the air is essential for ships assembled at a base within air-striking distance of an enemy.

Sir Philip Watts, who opened the discussion, said that there could be no questioning the statement of the author that sub-surface vessels or aircraft, or the two combined, could not replace surface vessels at the present time, whatever the future might bring forth in connection with naval armament. There could be no doubt that the superior strength of the British Navy for the last hundred years had had a tremendous effect in the preservation of the peace of the world. This superiority we were, with eyes open, abandoning as fast as possible, and a position would be reached when we should in some respect be weaker than any other great naval Power and be unable to afford adequate protection to the outlying parts of the Empire. With regard to the need of designing British Warships to resist the effects of torpedo explosion and of bombs, it was obvious that warship designers must provide for the almost certain advance in the offensive power of both submarines and aircraft. All the points mentioned by Sir Doveton Sturdee in connection with vulnerability were most important. On the subject of aircraft carriers, the author had laid stress on steadiness of platform and a good clear deck for flying off and landing. He—Sir Philip—remembered that in modifying H. M. S. *Furious* to convert her into an aircraft carrier, a proposal was submitted by Sir W. G. Armstrong, Whitworth and Co. for telescope funnels on the side of the vessel and telescopic masts for carrying wireless aerial and using elevators for the conning towers with the object of obtaining a perfectly clear deck for the full length of the ship. For some reason that proposal was not approved. He was in disagreement with the author on the subject of bulges. The pre-dreadnought battleships and cruisers had sufficient stability, and a number of vessels were lost from both gunfire and torpedo attack causing the flooding of a single large compartment. The *Dreadnought* class was designed with sufficient stability to be resonably safe against the flooding of compartments, and that observation applied to all vessels down to and including the *Queen Elizabeth*, and was also true of three ships of the *Royal Soverign* class to which bulges had been added. In the *Royal Soverign* class there was unfortunately a return of the old method of reducing stability with the object of obtaining a steadier gun platform, and bulges were added to correct want of stability.

There was no material advantage in adding bulges to a new ship, and it was understood that the new capital ships now under construction would not be fitted with bulges. It was, of course, essential that warships should have sufficient stability to remain upright as long as possible, as additional compartments were flooded, consistent with other requirements, as while all possible protection against injury should be provided there must come a time when the protection would fail and only reserve of stability could save the ship. There were various ways of making a ship a steady gun platform without reducing the stability to a dangerous degree. Bilge keels were commonly used; anti-rolling tanks were fitted in the old *Inflexible*, and in several vessels built afterwards, while gyroscopes were now being employed in a very practical form.

Admiral Clifton Browne said that great stress had been laid on the need for steadiness of gun platform, and from the gunnery point of view it was the most valuable asset in a fighting ship. The controversy as to whether and to what extent stability should be sacrificed to obtain a steady gun platform must be fought out by naval constructors. With regard to vulnerability from a torpedo explosion or mine attack, naval officers had a high opinion of paravanes and their design would doubtless be improved. The bulge was no doubt an effective means of obtaining greater safety for a warship, and that and other means of defense would doubtless advance with equal ratio with methods of attack. In connection with the proposal to build a number of cruisers up to the maximum of 10,000 tons displacement, the size of such vessels would make them rather vulnerable to under-water attacks, and it would be necessary to provide destroyers to protect the cruisers. His own view was that it would be a sounder policy to build smaller cruisers for the protection of merchant ships engaged in overseas trade, and to limit the number of large cruisers. On the subject of aircraft carriers, it seemed obvious that the comparatively low speed of those vessels would hamper the movements of the fleet. He agreed that the surface warship must persist, and that with the requisite number of cruisers and destroyers and other auxiliary aids the submarine would be kept in check.

Mr. W. J. Berry, Chief Director of Naval Construction, said that the Institution was very fortunate to have had the paper from Sir Doveton Sturdee. It was the first occasion on which an Admiral who had actually taken British warships through a victorious battle had communicated his opinions and reflections to the Institution. There was a wealth of detail in the paper, which clearly indicated the nature of the post-war problems in design. The points set out in detail all had an effect of modifying pre-war views and the conclusion arrived at in peace time as the result of fleet maneuvers, target practices, etc. The extreme ranges at which gunfire was effective in the war and the development of bomb dropping from airplanes had modified opinions on the subject of deck protection, while the progress made in torpedoes and the danger of near misses from heavy bombs had necessitated a reconsideration of the underwater protection of warships. There was the further requirement that in future British ships of all classes must be made suitable for action on the ocean, possibly far from their base. The limitation of displacement brought about by the Washington Agreement had also become an important factor in increasing the difficulty of producing satisfactory designs. The experience of the war had been the subject of close, continuous study by the Admiralty Naval Staff and the technical departments, and, following this, a great amount of research and experiment had been conducted by the Admiralty, new arrangements being first tried on a reduced scale of size, these experiments being followed up by full-size experiments where necessary. These had inevitably taken time and had involved the expenditure of a

considerable amount of money, but by the knowledge so obtained arrangements had been adopted in the latest ships with a view of making them safe against any known attack. In the past it had been the general case that the technical staff at the Admiralty had been fully engaged on current work, and indeed overburdened; time for thought about new developments had been exceedingly difficult to obtain. The author of the paper, whose experience made his opinion of the utmost importance, considered that the gun would continue to maintain its pre-eminence over all other weapons of offense. He fully shared that opinion. At present the gun was the only weapon of precision, on account of its high velocity and the possibility of accurate control. It was believed that armor and deck protection had been provided which would actually protect the vitals of the ship when fighting took place at the ranges which became usual in the last war. This belief was based on a comprehensive series of full-size experiments. Deck protection, which was effective against shell attack, would be effective against bomb attack. The latter, it must be remembered, was essentially an attack of comparatively low velocity, although there was the possibility of very large charges being dropped on the ship from airplanes. The question of anti-flash arrangements to magazines was taken up during the war, and the provision against flash enormously improved, and the matter had received close attention in the latest designs. It had to be remembered that safety arrangements of this nature on too elaborate a scale must inevitably tend to make efficient, rapid supply of ammunition a matter of great difficulty. If too many checks and safeguards were interposed, the failure of any one of which would stop the chain of supply, the whole object of the armament, which was to fire and to fire rapidly, would be defeated. The question of vulnerability to poison gases had been studied very closely, much experimental work was in progress, and the results already obtained were very promising. Of course, a boiler-room required such an enormous quantity of air for the boilers that protective for other than gas-masks were impracticable. Internal combustion engines also needed a supply of air. With regard to the two battleships now being built, the *Nelson* and *Rodney*, Admiral Sturdee could be assured that everything possible had been done in working out these designs to fulfil all known requirements. He would not expect details to be given. In the remarks about cruisers, the author did not mention the *Hood*, which was well protected and had effective bulge protection, or the *Repulse* and *Renown*. The *Repulse* had been bulged and the armor protection improved, and the *Renown* was now in hand at Portsmouth for similar alterations. All these three ships were 15-inch gun ships of very high speed. As concerned the requirements laid down for a British cruiser, he could say that all the qualities mentioned by the author had been satisfactorily met in the cruisers recently designed, with the exception that it had not been so far possible to provide arrangements for launching aeroplanes. If any surplus displacement remained when the ships were completed, that point could be further considered.

Sir George Thurston said that his objection to the fitting of bulges was that whatever might be gained from the point of view of protecting the ship was more than counterbalanced by the great loss of speed associated with the bulge, making it necessary to install enormously increased power. The author referred to the employment of a new type of under-water cruiser, and said he would like to know the kind of vessel Sir Doveton Sturdee had in mind. His own opinion was that a large submarine of the cruiser class could only operate in deep water, and any attempt to employ a vessel of that character in shallow waters would lead to very disastrous results. There were also disadvantages attached to the use of horizontal armor. Deck protection of that kind would add greatly to the weight of

the ship. It was difficult also to decide what should be sacrificed to enable any effective use to be made of horizontal armor.

Engineer-Captain W. Onyon referred to the question of machinery in warships, of which no mention was, he pointed out, made in the paper. In Lord Jellicoe's book mention was made of troubles with condenser tubes, and the importance of the subject could be illustrated by the statement that the failure of one condenser tube practically wrecked the *Lion*. He was glad to say that two new materials suitable for the construction of condenser tubes were now available, and were immune from corrosion. The Admiralty knew all about these materials, and unhappy experience with condenser tubes made from the material ordinarily specified suggested that use would have to be made of the new alloys, even if they added to the cost of the machinery equipment. Another source of trouble was the priming of water-tube boilers at sea, and it was necessary to find a remedy. In connection with the use of poisonous gases in warfare the author suggested that perhaps the employment for purposes of propulsion of internal combustion engines would obviate the need for large air spaces. That was, of course, a misapprehension, and as a matter of fact, more air would be required—the relation was 300 cubic feet to 334 cubic feet—if internal combustion engines were substituted in warships for steam plant. The loss of the *Audacious* went to show that in spite of all that could be done, it was not possible to prevent the loss of a ship from bottom damage.

Mr. W. H. Narbeth discussed the question of the vulnerability of the British battle cruisers which were lost during the war. It appeared from the account given in Von Scheer's book of what happened to the *Seydlitz* in the Dogger Bank action, that the charges in the magazine were fired by flash, whereas in the case of the *Queen Mary* and her consorts the magazines detonated. It was a question of the difference in the quality of the explosives used in the British and the German navies, and it was a subject which called for the most careful consideration. Mr. Berry had mentioned the fact of the Admiralty staff being only large enough for the ordinary work, with no reserve for research, and that was a weakness which must be considered in the light of the demand made in the paper for designs to be kept to date. The ideal plan would be to have a special staff to deal only with that branch of the work, so that the design of every foreign warship could be studied in detail. If that had been done in the pre-war period, we should have been taught many valuable lessons.

Sir Doveton Sturdee replied quite briefly to the points raised. He agreed that it was an advantage for the naval architect to know the views of the naval officer. Dealing with the gunnery aspect, it had to be admitted that the British ships were not trained to fire at the long ranges at which actions were fought in the war. The practice range was 9,000 yards, and men had to be taught to use a range of 16,000 yards. Competitions in gunnery had been too apt to consider rather the number of hits on a target than the range and variations of weather and conditions under which an action at sea might have to be fought. On the disputed question of the function of the bulge and its advantages and defects, he agreed that the necessary protection should be given by the original design of and not by the addition of the bulge. The expediency of concentrating on cruisers of 10,000 tons had been challenged, but as we were so deficient in cruisers of that class, their provision in adequate numbers must be the first consideration. The building of smaller cruisers could come later. With regard to what had been said by Mr. Berry, they were all agreed as to the need and value of research work, and money should be provided with the object of filling that need. Instead of ascertaining what was required in our warships through investigation and experiment,

we had adopted the more costly method of building ships to acquire that knowledge. On the subject of the navy generally, his own opinion was that at the present time we were less prepared for war than at any previous period of our existence. In putting forward his proposal for submarine cruisers, his idea was a vessel which would have the power to submerge for purposes of concealment. It was certain that if the power of submersibility had been possessed by the *Emden,* she would have had a much longer life. He was much interested in the suggested explanation of the superior resistance of German ships to the effects of gunfire.

U. S. Naval Development

Naval and Military Record, 9 April 1924.—While the United States Senators are discussing the further limitation of international armaments, Mr. Wilbur, the new Navy Secretary, has entered upon his rôle with a thoroughness which implies that he intends to maintain the Denby policy. Already he has asked the House of Representatives for an appropriation of eleven and a-half million dollars for the reconstruction of the four battleships of the *Utah* type. Now, under the terms of the Washington Agreement, capital ships may be repaired but not reconstructed, and it is possible that a nice point may be raised in connection with Mr. Wilbur's proposal.

In this case, we should probably be treated to long academic discussions upon the precise definition of the respective terms. Where do "repairs" leave off, and where does "reconstruction" begin? The *Renown,* for example, which has been for more than a year in dockyard hands at Portsmouth, is undergoing what would be generally defined as a pretty extensive reconstruction. It is true that her armament will remain untouched, and therefore her aggressive powers are not enhanced. But her defensive qualities will be materially increased, and her war value substantially improved in consequence. Yet it has never been suggested that the Admiralty are infringing the Washington pact.

Latest British Submarine

Army, Navy and Air Force Gazette, 12 April, 1924.—Work has begun at Chatham Dockyard on the navy's latest submarine, *O-1.* The ceremony of laying the keel plate was performed privately by Mrs. Royds, wife of the admiral superintendent of the Dockyard. In the navy estimates £237,860 is allocated for expenditure on the new vessel during the current financial year. Of this sum £90,000 will be for dockyard labor, £30,000 for materials, and £52,000 for contract work. The report that *O-1* will surpass *X-1,* which is to be completed at Chatham on June 16, is incorrect, as *O-1* will only be of 1,480 tons, as compared with the 2,780 tons of *X-1,* which is the largest submarine afloat at the present time.

British Encourage New Naval Parley

Baltimore Sun, 8 May, 1924.—London, May 7.—A distinct feeler toward a new naval disarmament conference was put forward by Premier MacDonald in the House of Commons today when he said he would be very glad to give Parliament a chance, when the naval estimates are debated, to pass a resolution in favor of a disarmament conference as an answer to a similar conference adopted by the United States Senate.

No time was lost in taking the Prime Minister's hint. Tonight two Liberal members, Sir Archibald Sinclair and Commander Kenworthy, introduced a motion for a discussion in the near future of the proposition "that the time has arrived for another conference on disarmament to deal

with all surface and submersible craft of 10,000 tons' displacement and less, and aircraft and other craft outside the scope of the Washington conference.

The question was raised this afternoon by Commander Kenworthy, probably as a result of dispatches appearing in the London press today reporting the agitation for more American cruisers and dissatisfaction with the naval position of the United States. Kenworthy asked the Premier to propose to the United States, France and Japan a conference to consider limiting cruisers and submarines. Premier MacDonald referred Kenworthy to his former non-committal answer, but when Kenworthy asked about the Senate resolution favoring a conference as a rider to the Naval Appropriation bill, the Premier said:

"They passed the rider not once but twice, and I welcome it as a manifestation."

The Sir Archibald Sinclair asked whether the government would not give the Commons a chance to pass a similar resolution and the Premier replied yes.

Although on the surface it would appear that these questions came up on the spur of the moment, it is believed, after a discussion tonight in the Commons lobby with the sponsors of the resolution and members of all three parties, that Premier MacDonald was previously informed of the supplementary questions to be asked and that he has planned to get the resolution through the House in the hope that it will act as an encouragement to the United States to call the conference suggested by the Senate.

The Premier apparently holds the view, however, that it would be premature for the British Government to take the initiative in summoning the conference. He wishes the proposal to come from Washington, not only because he holds its chances of success greater if this is done, but also because of the delicate issue involved in the attitude of France toward the submarine question at the present time. The resolution, if passed here, will thus be a gentle nudge to President Coolidge to go ahead, but it will involve nothing more.

There have been communications recently between the British and American governments regarding the questions of the alteration of gun elevations and the conversion of ships from coal burning types in relation to the Washington treaty stipulations, but the nature of these dispatches cannot be learned.

FRANCE

Ten New Ships Voted: Injudicious Top Hamper in American and British Capital Ships: Bocheland, first in the Air

By J. B. Gautreau, *Naval and Military Record*, 16 April, 1924.—Minister Bokaniowsky is beginning well, and might do grand things if stability and authority were compatible with our governmental régime. He had hardly comfortably sat himself in the historical *fauteuil du grand Colbert* than he persuaded the Chamber to vote 49,000,000 francs for ten new units to be placed in hand with the least possible delay: viz., two 10,000-ton cruisers (of 35 knots and eight guns of 8-inch bore), six 1,500-ton *torpilleurs d'escadre* of 33 knots, two 500-ton submarines, besides the erection of petroleum reservoirs. It is expected that Brest and Lorient yards will receive a cruiser each, while the two submarines will go to Cherbourg and the *torpilleurs* mostly to the St. Nazaire Chantiers, that are the best equipped in France, together with Normand (Rouen), for that class of work.

Recent exercises in the Mediterranean have conclusively shown the great rôle subsequent developments are likely to give to gas warfare in

the settlement of international quarrels. The gas factor will tell heavily in favor of the weaker side, that will offer the smaller and less vulnerable target to poisonous clouds; it will, also give a premium to speed, and will, in the end, produce a revolution in naval architecture. Especially, it will bring about a revival of armor, since armor is, under battle conditions, necessary to ensure perfect air tightness as well as the efficacious working of anti-poisonous appliances. Indeed, tactics on the high seas, as well as coastal operations, are revolutionized when submarines, fast motor vedettes, and seaplanes are fitted to produce or throw blinding clouds at will over the battle arena. Size and calibers become then of little moment, and proud and mighty Goliath falls an easy prey to fragile and cute little David. On the other hand, in coastal attacks, the advantage will be for the assailants, invisible behind mobile clouds, that will profusely and with impunity "pepper" with shell and bombs the wide and unscreenable targets offered by arsenals and dockyards.

Change is not always synonymous with progress. A noted French officer, after successively visiting two British light cruisers, a *Birmingham* and a *Delhi,* gives the preference to the former pre-war type, on the main plea that a man-of-war has not for *raison d'etre* to carry the maximum of guns and motors, and of fighting material in the smallest displacement, but must be made primarily for the comfort and efficiency of combatants. Fighting worth is not measured by the weight of the arsenal and the number of weapons a ship carries, but by the fitness of the crew to use the armament to the greater advantage, that is, by the conditions of habitability, the all-round roominess and the space provided to maneuver with ease guns and torpedo tubes. Now, in the *Delhi,* though she is a masterpiece of work in the matter of the military utilization of displacement, there are two or three guns rather awkwardly placed, that are something of a make-believe, whereas in the *Birmingham* (inspired from Sir William White's ideas) all guns enjoy command and arc of fire, and four 6-inch weapons can fire right ahead—against only one in the *Delhi.*

There is something highly pleasant and unforeseen in the vagaries of Madame La Mode maritime, when it is remembered that those pagoda-like superstructures and heavy top hamper that were so heartily laughed at in the French Jaureguiberry and other *cuirassés* of thirty years ago, as being something unmilitary and nonsensical, and as contrasting with the wise unmilitary-like soberness of the majestic line of battleships designed by Sir William White, are being revived and with a vengeance in the latest British and American battleships that, seen end-on, look upon the water like small seagoing Eiffel towers. Soberness is at present on the French side, as can be seen by comparing the rebuilt *Lorraines* with the British *Royal Sovereigns.* The U. S. S. *Colorado* especially caused some consternation among French officers, who much admired the two-storied cottages adorning the top of the tremendous masts at such great height above water. Such innovations are thought, all points considered, to offer more drawbacks than utility in these times of heavy bursting shells with chemical effects, creating melting heat. A monster shell encountering one of these American pagodas would bring the whole structure down, on the top of funnels and turrets. Better the French tripod masts with space between their legs and which no single shell, however heavy, could bring down, though perhaps the most valuable asset, in these days for a fighting mast is to be narrow enough to attract the least possible attention from enemy gunners.

From the reports of Alsatian officers in Germany, the Fatherland is bracing herself up for the *revanche* at sea as well as in the air. For the number of trained incorporated avaitors and of machines instantly ready for action, she may be yet inferior to France. On the other hand, she has

devoted to aerial scientific research twenty times more money and efforts than our Republic has done, and for this reason the future belongs to her. So rapid is aerial progress, so short the longevity of aerial motors and flying machines, that air power is not measured so much by the actual number and strength of aerial fleets as by two factors: viz., the constructional capabilities of factories and the scientific efficiency of flying designs ready to be put in hand. Of all those secrets all great Powers have more or less in store to be revealed only after war has burst out, it is to be feared Germany has the most in reserve—and such possibilities, indeed, concern all the Allies, the radius of action of large modern bombing machines exceeding 1,000 miles, a *fait nouveau* which will possibly depreciate the value of naval defense and totally modify the aspect of warfare.

Many here were of the opinion that Germany would be sobered by her defeat and forever disgusted with the idea of "making her future on the water." Such expectations have been in no way realized. So effective has been the propaganda carried on by the German Flottenverein and by German school masters, and since the war intensified by naval officers "on half-pay" who are spending in popular propaganda the time they cannot pass at sea, that every German now sees clearly the deciding rôle played by sea power in the world war and the true causes of Germany's failure to achieve her war aims: viz., European hegemony, which is a repetition of the Napoleonic experience. And so the imperialistic leaders of modern Germany are setting to work for the realization of a coldly and methodically-prepared plan of naval reconstruction—first, to foster the spirit of the sea among the German masses, especially in industrial centers (any competent mechanician or engineer is a half-trained naval fighter); secondly, to use the small and obsolete (but perpetually modernized and used as experimental laboratory), battle squadron of 14,000-ton Braunschweig for training the largest possible number of officers and men, on the lines adopted for army training in the Reichswehr; thirdly, to have ready, under camouflage (no longer necessary since the suppression of interallied control) adequate means of quick and telling offensive at sea in the shape of seaplanes, submarines (made in parts in inland factories) fast motor-boats, and of modified mercantile vessels (surprises in store in the latter respect). In this way when *der Tag* comes, anew distressing blows will fall on France from unexpected quarters, and victorious Bocheland will retrieve her naval rank with her colonies, and at last occupy on the globe's surface the place due to the weight and pushful propensities of her population.

Relative Worth of French Cruiser Fleet

By J. B. Gautreau, *Naval and Military Record*, 23 April, 1924.—The two 10,000-ton cruisers ordered by Minister Bokaniowsky, though in themselves a valuable addition to the *Marine Francaise*, will prove quite powerless to retrive the unprecedented inferiority of France on the water, for the reason that rival Powers are more than maintaining their advance. Great Britain's cruiser fleet—already worth ten times the three *Duguay-Trouins* now building (forty-eight units of over 27 knots against three for France)—will be reinforced by seven 10,000-ton cruisers (including two for Australia). Italy, that possesses ten scouts of 26 knots and over, being thus superior to France, is ordering the two first units of a numerous series of heavily-gunned (ten guns of 8-inch bore) cruisers, which Signor Mussolini announces will be the first in the Mediterranean.

As to the United States, that country will this year order eight 10,000-ton cruisers of 36 knots, with a view to strengthening her present ad-

vantage for speed over all-comers. The ten *Omahas,* a few representatives of which class have been carefully examined by French experts, are deemed to be a splendid investment in every respect. Not only are they the swiftest afloat, 35 knots having been reached by the best of the series, but they also carry the most rational armaments which is distributed in conformity with the latest interpretation of the lessons of the war. Their battery is better protected than that of war-built British scouts and enjoys superior command and arc of fire; and especially they train six weapons end-on, with a range of some 20,000 yards—hence a crushing advantage over all rival scouts in service. Moreover, they will for that reason prove formidable antagonists to destroyer flotillas. Indeed, the wisdom of constructing 33-knot *torpilleurs* in these days may well be contested.

The two *croiseurs légers* of 10,000 tons to be laid down next summer at Brest and Lorient will be, in every respect, enlarged and much-improved copies of the completing *Duguay-Trouin* of 8,000 tons. The valuable experience gained in the construction of these fast cruisers, that are the first modern scouts built in France and something of an experiment, will be turned to good advantage in the making of the new ships. The hull design notably has been perfected, and it is confidently expected that there will be this time no room for reproach sometimes assigned to French ships that they require to produce on a given speed a higher nominal power than their English rivals. They will be cut not quite so fine as the *Duguay-Trouins,* that are over ten times longer than wide (17.5 and 17.20 meters), and only five meters deep in the water, but, with their length of 185 meters, their width of 19 meters, and draught of 6.30 meters (aft), they will be on finer lines than the British *Raleigh-Effingham* class (184.50, 19.82, 5.20 meters for the various dimensions), and ought to be steady sea-boats and maintain a high rate of speed in heavy weather. Structural robustness, that has much to do with speed, has received special attention, especially since recent experiments have shown the need of increased longitudinal robustness in vessels of such relatively enormous length, compared with the width and depth, and intended for such high speed. Without sufficient robustness, speed in cruisers (as in destroyers) is apt to be something of a make-believe, as French naval men have learned to their cost with their *Chateaurenault, Guichen, Marseillaises,* and Italians with their light cruisers of the *Guarto* type.

The armament of the next *croiseurs légers* (eight guns of 8-inch bore) is being criticized in some quarters as lacking in originality and strength. The axial twin turret distribution, as in the British *Queen Elizabeth* and *Royal Sovereign,* though it has successfully withstood the test of time and of war, and is generally considered as offering the maximum of advantages, has drawbacks from a constructional standpoint: viz., it has the effect of inflicting heavy strain on certain parts of the ship, besides reducing in practice, at least for end-on fire, the fighting value of the lower turrets in the echelons, and, further, is cannot be said to realize the maximum possible of arc of fire. The disposition adopted for the 12-inch gun turrets in the British *Invincibles* and in the German *Von der Thann* appears to many officers to be an ideal one. Not only does that system enable all eight weapons to be fired abeam on a target, while providing six guns for end-on fire, which is a capital advantage for a cruiser—cruiser actions being end-on affairs, as the war has proved—but besides, owing to the great distance between the turrets, the turret bases and magazines can be installed under conditions more practical and more secure, no two turrets being exposed to simultaneous destruction by a single internal explosion, and in practice a higher rate of fire will be

maintained, there being no interference between the turrets, and the firing strain, that will be considerable when the ship is belching forth its salvos, is better divided over the whole hull.

The aviation danger has not been overlooked by the designers of our 10,000-ton cruisers, and good use is being made of data gained in the Prinz Eugen experiments. Armor decks and screens could be devised that would afford reasonable protection, at least against moderate-sized bombs, but the weight would be enormous and incompatible with speed. Therefore, it has been considered that the best defence lies in a vigorous offensive expressed by a hail of chemical projectiles wrapping hostile seaplanes in a deadly cloud of asphyxiating gas, and, to that effect, the *Duguay-Trouins* and the *Bouvets* will be supplied with no fewer than twenty anti-aerial quick-firers, with some 10-kilomter range.

Triple turrets, proposed by some, have few partisans in the service. They are thought to be too heavy for light ships. Of course they could be thinly armored, but in that case they would turn out to be nothing but death traps and an excellent recipe for having several guns disabled at one blow. The advent of chemical warfare renders thick, airproof armoring necessary, the better no armor around guns rather than thin plating vulnerable to small shells. Seaplane attacks will be the most to be feared for cruisers navigating European seas, and woe to the crews of thin turrets not specially designed to be gas proof.

Coastal operations in pre-war style, with bombardment and landing (Dardanelles fashion) are being carried out with commendable skill both by the Brest and Toulon squadrons, and the defence of French shores, both by gun batteries and sea-going ships, has never been previously studied with such admirable perserverance. At the same time, discontented critics are depicting those picturesque spectacular maneuvres as being out of date and misleading, since it is contended the danger to French seaports will in the next war come from the heavens in the shape of swarms of heavy bombardment seaplanes, that will do infinitely more harm than fine battalions landing, even wih bands playing.

GERMANY

War on Vast Scale Possible in Europe

By Hector C. Bywater, *Baltimore Sun*, 21 April, 1924.—London, April 2.—Most readers of Mr. Lloyd George's book, *Where are we going?* are agreed as to the aptness of its title, though some think the interrogation superfluous, seeing that Europe, if the author has correctly gauged the facts, is marching straight toward perdition. He views the old Continent today as "a seething caldron of international hates, with powerful men in command of fuel stores, feeding the flames and stoking the fires."

The metaphor is striking, no doubt, but while a caldron may seethe and even boil, it can scarcely explode. Lighting a bonfire under a powder-magazine would, perhaps, better describe the actions of certain "stars" in the European drama as it is watched by pessimistic spectators.

We are now within sight of elections in France and Germany which may possibly exercise a decisive influence on the trend of events. With the ineptitude which nowadays marks almost every act of Germany's political chiefs, the Reichstag polling day has been fixed for May 4—that is, a week in advance of the French elections. Whether this is a gesture of defiance, or simply a dull blunder, it is hard to determine, but the fact remains that if, as it seems probable, the German Nationalists score a big success at the polls, the French are likely to retaliate by returning a large majority of Deputies whose watchword will be: "No compromise with Germany."

It is clear already that the French Cabinet changes of last week did not foreshadow any modification of M. Poincaré's Ruhr policy. MM. Loucheur and de Jouvenal both hold portfolios, it is true, but the Premier's statement in the Chamber on Monday, reiterating the determination of France only to withdraw her troops in proportion to payments, shows that M. Loucheur has had to subordinate his opinions on this question to those of his chief, as also that M. de Jouvenal has not fired the Premier with his own enthusiasm for the League of Nations.

Apparently the French Government is to remain as much a "one-man show" as before. M. Poincaré's policy, whether right or wrong, is the only policy that goes in France today. So long as he is in the saddle no olive branch will be tendered to Germany.

On the other side of the Rhine things are taking their logical course—logical, that is, in the light of German mentality and Prussian methods of statecraft. All indications point to a sweeping electoral victory for the parties of the Right, and, following that, to the setting up of the most stiff-necked Berlin Cabinet with which the Allies have had to deal since the war. Then, if M. Poincaré remains in power, with a solid majority at his back, the long-drawn-out Franco-German controversy may swiftly reach its acutest phase, possibly developing into war.

While the world at large would regard this as a frightful catastrophe, there are elements both in France and Germany by whom it would be hailed with joy. One can understand, without necessarily sympathizing with, those Frenchmen who are burning to apply the blood-and-iron solvent to the German problem. Germany's Nationalists, by their foolish caperings, have played straight into the hands of French chauvinism, just as the jack-boot policy of France has not merely kept alive the embers of militarism in the Fatherland but fanned them into fierce flame.

Having regard to the dire possibilities now looming ahead, it is futile to speculate on what might have happened had a different policy been pursued on both sides. There is, however, rather too pronounced a disposition in some quarters here to lay the whole blame for the present imbroglio on French shoulders.

That the handling of the reparations problem of France has done violence to the true principles of statesmanship may be admitted, nor is it to be denied that her craving for security has led her into acts calculated to defeat the very object in view. As a prominent German Nationalist has said, "We don't need to make propaganda: the French are doing it for us, and doing it ten times as effectively as we could."

But in fairness to France let us ask ourselves whether she would be any the better off today had she adopted from the first a policy of conciliation toward her old enemy. In attempting to answer this question we must give due weight to the fact that the military caste in Germany, though nominally suppressed since the peace, has nevertheless continued to exert a powerful influence on the direction of national affairs. While the *Herr Offizier* may have fallen from his pre-war pedestal, where he was worshiped as a superman, his social prestige is still immense.

The leaders of the movement are satisfied with the progress it is making that they have hitherto sternly discountenanced premature coups, such as Ludendorff and Hitler tried to bring off. It is certain that the Munich fiasco —to which the farcical "trial" just over was a fitting sequel —was never approved by the body of Prussian Nationalists. They want to overthrow the republic and make war on France, it is true, but only at their selected moment.

Meanwhile the semi-secret training of Germany's youth for the next war goes steadily forward. On that point there is no room for serious doubt.

For more than twelve months now there has been practically no Allied supervision of German armaments, and in that period it would have been possible for the highly-developed German industry to have produced a very large quantity of war material. The great Krupp arsenal at Essen could give no help in the matter, because it is under French control, but there are scores of factories remote from occupied regions at which military equipment of all kinds could be produced.

Much is heard of the wonderful efficacy of the French intelligence system in Germany, but French military experts are less enthusiastic about it, most of them believing that Germany has taken advantage of the cessation of Allied control to build up reserves of artillery and other munitions. It is significant at least that the German Cabinet should oppose so strenuously every suggestion for a renewal of control, even in its most modified form. This attitude certainly indicates that there is something to conceal.

Before deriding the possibility of Germany secretly rearming herself for a new struggle, let us remember that the ablest soldiers living, from Marshal Foch and General Ludendorff downward, believe the next war will differ radically from the last one in regard to the material and tactics employed. They foresee it primarily as an affair of chemistry and mechanics.

The development of toxic gas as an agency of war has hardly begun, they declare. Trench campaigning is probably obsolete. Hostile positions will no longer be stormed by waves of infantry. They will be drenched with deadly fumes by artillery and aircraft. Both in France and the United States new gases have been evolved, against which the most efficient mask is useless, and it would be absurd to pretend that German chemists are inferior in skill to their foreign confrères.

France has a mighty fleet of aircraft, while Germany, so far as we know, has scarcely any military planes. But what if the Germans have hit upon a method of immobilizing hostile planes by burning out their magnetos or induction coils by high-frequency radiations? Professor Dackzweiler, an eminent Belgian scientist, believes it quite possible that "the means of stopping airplanes, dirigibles, automobiles, etc., from a distance has been discovered beyond the Rhine," and in a paper written for the *"Bulletin Belge des Sciences Militaires"* he explains how it could be done.

True, the evidence of such a discovery having been made is only circumstantial, but it is also true that the number of forced landings by French aircraft last year while crossing German territory was so great that the French air routes have been diverted to give Germany a wide berth.

Even after full allowance is made for the overweening egotism, coupled with ignorant contempt for the foreigner, which stamps the Prussian Junker, it is still remarkable that the German Nationalists should now be working with all their might to precipitate a clash with France. What resistance could they hope to offer if France were provoked into launching a fresh invasion of the Reich?

All present calculations are based upon the assumption that French military power is, for the time being, invincible, as indeed it is if the mechanism of war has undergone no fundamental change since 1918. But those conversant with the German genius for subterranean organization there is something ominous in the ill-concealed jubilation which now prevails in Nationalist circles. It suggests the holding of trump cards, of hidden resources potent enough to warrant supreme confidence in the result of what, at the outset, would impress the world as an insane gamble.

There is cold comfort in the advice proffered by Lord Grey, of Fal-

loden, that if France and Germany insist on coming to blows, the other nations should stand clear and let them fight it out. It would not in any case be a straight duel between Germany and France. The latter would do her outmost to bring Poland and the Southern Slavs into the conflict as her allies, while Polish intervention would inevitably be followed by that of Russia on the German side.

Nor is there any guarantee that the conflagration could be localized even to that extent. And in whatever way it ended, Europe would be no better off in the long run. If France were to triumph, her military ascendancy would become absolute, and she might then be less backward in exploiting it. If, on the other hand, she suffered defeat, would peace and tranquility be more secure when Europe lay at the mercy of a victorious Russo-German confederation?

German Expert Hopes to Make "ZR-3" Cross the Atlantic in 100 Hours

Philadelphia *Public Ledger*, 12 May, 1924.—Friedrichshafen, May 11.—"Our meal bag" is the name the Germans of Friedrichshafen have bestowed upon the Zeppelin *ZR-3* which is being constructed here for the United States Navy. Virtually everything in Friedrichshafen hinges upon the zeppelin works, and the Germans admit it will be a sad day for the town when the big dirigible sails away for America.

Construction of the airship has given employment to 1,000 men at various times, and all these will lose their jobs when it has been completed, as under the terms of the Versailles Treaty the enormous Zeppelin shed here must be demolished as soon as the *ZR-3* is finished. German citizens calmly admit they would be very much satisfied if the dirigible were delayed "another year or two."

The "jump off" will not be made, says Dr. Hugo Eckener, who will pilot the ship to the United States, until the five great motors have shown that they have been perfected so as to withstand a four or five day run. It is figured that with good weather conditions, the flight from here to Lakehurst, N. J. will be made in 100 hours.

"During the war," says Dr. Eckener, "motors for the Zeppelins were constructed to run nineteen or twenty hours—for a trip to London and back for bombing purposes—and then the engines were given a general overhauling. Our desires to perfect motors to operate continuously for five times this length of time have not yet actually been realized. This has caused us to delay the start.

"Our engineers report constant progress in their tasks of perfecting the motors, and I believe it is possible that we may get started some time in June. But I am not certain about this. It all depends upon the motors—and not upon me."

Dr. Eckener is an inveterate pipe-smoker, but no tobacco-smoking is to be allowed during the trans-Atlantic trip. "The idea of leaving my pipe behind is what is bothering me," says Dr. Eckener," and not how I will get the ship across.

JAPAN

Immigration Issue in America and Japan

By Hector C. Bywater, Baltimore *Sun*, 8 May, 1924.—Long cable dispatches to the newspapers from Washington and Tokio reveal the interest which is taken here in the immigration controversy between America and Japan. In some quarters there is a tendency to exaggerate the significance of the crisis; in others its possibilities are, perhaps, unduly

minimized. It certainly would be premature at this stage to interpret Ambassador Hanihara's allusion to "grave consequences" as a forecast of violent action by his Government.

By many of those who have studied the American-Japanese problem, this question of immigration has not been regarded hitherto as one of the really crucial issues. The number of Japanese subjects whom it personally affects is small. In recent years the flow of Asiatic emigration across the Pacific, or at any rate toward the United States, has greatly diminished.

I have not the exact figures at hand, but I am told on good authority that there has been the merest trickle of Japanese settlers into the United States since 1921, compared with considerable volume arriving in previous years.

This reached high-water mark in 1907, when 30,226 Japanese were admitted. In the following year the number dropped to a mere 5,803 There was a further sharp decline in 1909, when no more than 3,111 came in and in 1910 only 2,720 arrived—the smallest contingent since 1898.

This sudden falling off in numbers was due, of course to the "Gentlemen's Agreement," a compact negotiated in 1908 as an alternative to drastic legislation on the American side, which would have had the effect of excluding all Japanese save those of official status. In fact, the situation of 1908 was very similar to that which now prevails.

What lies behind the Senate's move, not only in canceling the "Gentlemen's Agreement" but in barring all Japanese from the United States, remains a mystery, but it seems obvious that a step so momentous would hardly have been taken without some powerful motive. It is possible that new evidence transpired of the manner in which this agreement has been violated—not with the cognizance of the Japanese Government.

It seems to be established that a great many Japanese who ostensibly emigrate to Mexico and Brazil are afterward seen in United States territory. One thing is beyond question: The Japanese colonies along the Pacific slope are today appreciably larger than a careful estimate, based on immigration statistics and making full allowance for the fecundity of the race, would make them out to be.

Another important point, which deserves to be stressed, is the determined efforts of Japan to retain control over those of her nationals who have settled abroad. Japanese consuls in the United States and elsewhere always advise immigrants to register as Japanese subjects the children that are born to them on foreign soil. In the case of males, such registration carries the obligation of military service in the Japanese army and navy, and neglect of this duty would apparently be visited with severe penalties should the defaulter ever travel to Japan.

The position of the Japanese immigrant is, indeed, one of great difficulty. He is ineligible for citizenship in the United States; yet, to retain his own nationality, he must perform military service in Japan, and if he does this, either before or after settling in the United States, a certain suspicion attaches to him as an alien who is trained in the use of arms. The existence in their midst of a large body of Japanese, many of whom have served with the Mikado's forces, is quite naturally viewed with disquietude by the white communities along the Pacific seaboard.

It may be that the people of California take too serious a view of the matter, and that the anti-Asiatic legislation now in force and contemplated is needlessly draconic, alike from the standpoints of sociology and defense. Even so, California is no more intolerant or apprehensive in this connection than Australia, whose doors are virtually barred and bolted against the Asiatic.

The action of the United States Senate in adopting the Japanese Exclusion Amendment to the Immigration Bill is regarded here as a

counter-blast to Mr. Hanihara's note, with its ill-timed reference to the "grave consequences" which might follow even if Japanese were placed on the same immigration footing as other foreigners.

True, the Japanese quota of 240 per annum is disproportionately small, but, as a New York correspondent observes, "Japan does not care very much for so insignificant a quota in her population of 80,000,000, but she does resent the brand of racial inferiority being placed upon her proud people."

This, it is to be feared, will be the line taken by the Japanese press. Public opinion there is already inflamed, judging from the latest dispatches, and the most widely read papers, which happen also to be the most chauvinistic, are indulging in language the reverse of temperate. A nation-wide outburst of anti-American feeling seems to be imminent, if it has not already developed.

This is the more to be regretted because a distinctly cordial spirit toward the United States has been manifested of late by all classes in Japan. The prompt and generous way in which America came to their help after the terrible earthquake last September was deeply appreciated, for ingratitude is not a Japanese failing.

But the fact must not be blinked that, if the new exclusionist policy is enforced, the future relations of the two countries will be somewhat strained. This prospect would be less disturbing if immigration were the only issue. But it is not. American interests in the Far East are already considerable; they are growing steadily, and, in the last resort, their welfare depends upon the good will of Japan, whose supremacy in that part of the globe is absolute. She alone is warden of the "open door," which she can keep open or shut tight, just as she pleases.

Unless the immigration dispute is composed in a manner more satisfactory to Japan, it is to be feared that American business in Eastern Asia will not continue to make headway. The Japanese are notoriously clever at devising those Oriental methods of obstruction which are so difficult to trace to the authors. For a time, at all events, Japan's resentment is likely to be confined to tactics of this nature, the brunt of which will fall on American residents and commercial interests in the Far East.

It is very improbable that Mr. Hanihara's allusion to "grave consequences" had a more sinister meaning. The phrase is one so frequently employed by Japanese diplomats that it is doubtful whether they know how ominous it sounds in western ears. In using it Mr. Hanihara was only repeating what his government said last January, when the Tokio Foreign Office, in reply to a question raised in the Diet, issued a statement which began as follows:

Immediately after the United States Supreme Court's decision regarding the alien landownership dispute was made known, the Imperial Government took steps to call the serious attention of the United States to its grave consequences, and is now awaiting a reply from that Government.

Although this statement was published nearly three months ago, it does not seem to have attracted much notice in Washington. At that time, possibly, the Tokio Foreign Office was thinking chiefly of the consequences that would fall on its land-owning nationals in California; whereas Mr. Hanihara's note, in which the same phrase occurs, pointedly referred to Japan's relations with the United States.

The moral of his dispute is plain enough. It serves to remind us that there is still plenty of combustible matter in the Far East and that, given the will on either side, nothing would be easier than to kindle a blazing conflagration there.

Writing last week, when this new cloud on the political horizon was no bigger than a man's hand, I showed how the Naval Limitation Treaty,

by consigning whole fleets of fighting craft to the junkpile, had saved the taxpayers of the United States, Japan and Britain enormous sums of money. Today, however, one begins to realize more clearly the value of that treaty as a preservative of peace.

Let us assume that the Washington Conference had never taken place; that both the United States and Japan were still building dreadnaughts by the squadron, and that the development of Pacific war bases was proceeding on both sides with feverish energy. If that were the naval situation at this moment, would not the present difference of opinion between the United States and Japan be viewed with extreme anxiety by lovers of peace, and would not the words of a Japanese Ambassador in Washington, who spoke of "grave consequences," be at once construed in their most ominous sense?

For all its beneficient results, the Washington Conference did not necessarily usher in the millennium in the Far East, but it undoubtedly helped to make war probable, not only by rendering it more difficult but by largely eliminating the economic and psychological factors which were tending to create a war-time atmosphere in the Pacific.

Saghalin Gives Japan Oil-Burning Warships

Philadelphia *Public Ledger*.—Tokio, May 13.—(By A. P.)—The Navy Department has under consideration plans for converting some of its major warships into oil burners.

All Japanese capital ships are built to burn either coal or oil, but Japan, afraid to depend on her visible supplies of oil for times of emergencies, has not dared to make her capital ships oil burners.

Now, however, with the opening of three oil wells in Northern Saghalin, the position has changed.

Northern Saghalin has been occupied by Japan since 1920, but is normally Russian territory. The Japanese are holding it, professedly, to enforce reparation for the Nikolaievsk "massacre," but the Soviet Government refused to negotiate on such reparation, declaring Japan intends to hold the territory because of supposed large oil resources. Japan has offered to confirm her possession by purchase but Moscow refuses to sell.

Moscow's charges that the Japanese are developing the oil region on a large scale appear to be borne out by the dispatch above. The Soviet granted the oil rights to the Sinclair corporation but the Japanese expelled the Sinclair engineers.

Tokio Prince to Visit U. S.

Philadelphia *Public Ledger*.—Tokio, May 13.—Announcement of the route to be taken by the naval training squadron in a voyage around the world makes it certain that Prince Takamatsu, the third son of the Emperor of Japan, will visit American ports this year.

Prince Takamatsu, now a midshipman at the naval academy at Etakima, will be aboard the cruiser *Asama*, flagship of the squadron, ranking merely as one of 300 midshipmen.

Supplementary Japanese Estimates

Naval and Military Record, 23 April, 1924.—Those who expressed the opinion that the disastrous earthquake would relegate Japan to a second-rate status amongst the naval Powers must find food for considerable reflection in the supplementary estimates which have just been presented, and are pretty certain to be approved. These are almost wholly devoted to provision for making good the damage done by the earthquake. The

total expenditure proposed for reconstruction is 92,000,000 yen (the yen is worth 2s. 3d.), of which 66,000,000 yen is for the replacement of armament and the balance for building purpose. Reconstruction and replacement naturally means modernizing, and the net result will be that when she has made good the earthquake damage Japan will be in a materially stronger position than before.

It is estimated that the work will occupy between eight or ten years to complete, or about half the time, which was computed for the fulfilment of the Singapore scheme. It is not at all clear to what extent the Japanese naval dockyards suffered during the convulsion. A great deal of money is to be spent on the Yokosuka base, but whether this is really the result of the earthquake or whether the earthquake has been made the excuse for the outlay is very doubtful. Japan at the present time is carrying out by far the biggest program of warship construction of any of the sea Powers. A large proportion of this was on the slips in August last, but there is no reason to believe that any appreciable delay in progress has occurred.

UNITED STATES

Comments on Articles in the New York "Times" of April 28, 1924, Quoting Mr. W. B. Shearer

Navy Department.—Washington, May 8, 1924.—MY DEAR MR. CHAIRMAN: In reply to your letter of April 29, 1924, I am forwarding herewith a statement concerning the article by Mr. Shearer which appeared in the New York *Times* April 28.

I trust that this statement will fully cover the information which you have requested.

Sincerely yours,

THEODORE ROOSEVELT, *Acting.*

HON. THOMAS S. BUTLER,
Chairman Committee on Naval Affairs,
House of Representatives.

In the following pages Mr. Shearer's statements are placed in quotation marks. These are followed by the department's comments.

1. "Navy out of date."

In the items enumerated below, either the latest modern practice is not incorporated or the latest equipment or latest types of ships are not provided.

(*a*) Gun range of thirteen battleships.
(*b*) Deck protection of six battleships.
(*c*) Underwater protection for thirteen battleships.
(*d*) Kind of fuel on six battleships (oil).
(*e*) Submarines—No mine laying or cruiser types.
(*f*) Cruisers—Shortage in numbers.
(*g*) Destroyer leaders—None.
(*h*) Fuel economy—Lack of certain up-to-date engineering equipment; between $1,000,000 and $2,000,000 being considered in Congress now.
(*i*) Material readiness of ships out of commission—Especially destroyers and submarines.
(*j*) Auxiliary ships—Speed and radius limited in certain auxiliary ships converted from merchant marine.

2. "Did not profit by lesson of war and is now outclassed."

We have profited by the lessons of the war and have in many cases given them effect. But there are other directions in which improvement has had

to wait upon appropriations. (See paragraph 1, (*b*), (*c*), (*d*), (*e*), (*f*), above.)

3. "'Not only have we neglected the Navy so that the 5-5-3 treaty ratio is actually 5-3-1, with America 1,' Mr. Shearer said, 'but we have failed to modernize the fleet as well. That is in marked contrast with the British and the Japanese. They learned the lessons of the war. We paid no attention to them.'" * * *

(1) The positive statement that America is 1 in relation to Great Britain and Japan is not correct. It is impossible to make a mathematical ratio of naval strengths that will cover all factors. About the best we can truly say is that if 5 and 3 represents the present fighting strengths of Great Britain and Japan, respectively, then the United States would appear to be approximately 4.

The ratio in the various types of ships is given below:

BATTLESHIPS

The battleships *Florida, Utah, Wyoming,* and *Arkansas* required boiler repairs in order to maintain their speed. Until this could be done the speed of these four ships was reduced and they had to drop out of the battle line. This reduced the ratio to 5-4-3.

All of these ships can now maintain their speed except the *Florida,* which would be able to make her speed after reconditioning.

The Navy Department has asked for funds to recondition these six oldest battleships and to give them new boilers for oil burning, because the life of these boilers has about reached the limit.

CRUISERS

Cruisers built, building, or authorized since 1912 compared in ratio of the number of cruisers—

Great Britain	5
United States	1
Japan	3

And compared in tonnage ratio—

Great Britain	5
United States	1.5
Japan	3

DESTROYERS

Comparing number of destroyers in commission with full or reduced crews as of October 1, 1923—

Great Britain	196
United States	109
Japan	63

Or ratio of about—

Great Britain	5
United States	3
Japan	1.5

Comparing actual numbers of first-line effective destroyers in and out of commission—

Great Britain	201
United States	288
Japan	92

Or ratio of 5-7-2.

SUBMARINES

Built and building, 485 tons and over, tonnage ratio is—

Great Britain	4.7
United States	7.6
Japan	7.3

AIRCRAFT CARRIERS

Built and building on tonnage basis—

Great Britain	5
United States	4
Japan	3

(2) For the positive statement that we have paid no attenion to the lessons of the war, this is not correct. We have paid attention to these lessons, but it has not been practicable to apply them in several important particulars. (See par. 1, (*b*), (*c*), (*d*), (*e*), (*f*).)

4. "Perhaps the greatest lesson of the war was the effectiveness of the torpedo. Until 1914 no one in or out of the Navy dreamed of the power of the torpedo. No one dreamed it was a weapon of such importance that upon it might hang the success or failure not only of naval units but of military units as well. Within a month after the outbreak of hostilities, however, the torpedo had become one of the chief weapons of naval warfare. That came about when three British cruisers, the *Hogue*, the *Cressey*, and the *Aboukir*, were sunk in the North Sea."

This statement is controversial. The effectiveness of the torpedo as the greatest lesson of the war is open to doubt. It had great effect.

The last sentence is approximately correct.

5. "Efficacy of 'blistering.'"

"It was not long before the torpedo had made the seas unsafe for capital ships and the British turned around for some method of protection for their battleships. They decided to 'blister' them.

"Now a blister is, roughly speaking, an outside hull, put on both sides of the vessel below the water line, for it is below the water line that the torpedo strikes. They blistered such of their ships as they could during the war. They have blistered them all since the war.

"They have done more than give protection to the ship, however, in this process of blistering. They have utilized that space inside the blister to carry reserve oil. This not only adds to the protection and adds to the displacement of the ship, but it increases its cruising radius to perhaps 23,000 miles. Curiously the blister also adds to the speed of the ship."

First paragraph is correct, in so far as regards the British adopting blisters to minimize the effects of torpedo hits.

Second paragraph is correct, except for the last sentence. As far as our information goes, when the *Rodney* and *Nelson* are completed the British will have equipped ten of their twenty battleships with blisters or their equivalent. England has ten battleships that will need blisters. The United States has five ships of their eighteen fitted with the equivalent of blisters and has thirteen ships that need blisters.

Third paragraph. There is no reliable data on the points brought out in this paragraph. Blisters do add to the displacement of ships, but they decrease the speed. Oil carried inside a blister will give some protection.

6. "Japan is also blistering her big ships. She is to spend 50,000,000 yen for modernization of nine ships, and much of it is to go for this work of blistering. Her ships of the *Fuso* class are to be blistered. That means they will have protection against torpedo attack; they will have so much more reserve fuel oil and their cruising radius will run up to 23,000 miles.

"We have done nothing. None of our ships are blistered. None are to be blistered. The navy wants it done, but what the Navy wants and what Congress gives it are two different things."

First paragraph. It is not definitely known what Japan is doing with regard to blisters. It is true that Japan intends to spend 50,000,000 yen for modernizing ships. But nothing definitely is known how this money will be spent. Press reports state that the Japanese ships are to be converted to oil burners and given increased deck protection.

Second paragraph. Statements as to blisters on the United States ships are incorrect. United States has five ships with equivalent of blisters and thirteen ships that need them.

7. "Neglected lesson of war.

"We have not only failed to modernize our ships by blistering them but we have failed to learn the lesson of deck armor as well. Nowadays the angle of fire is so high and bombing so feasible that the vitals of a ship are unduly exposed to attack. These vitals are the machinery, fuel, and ammunition. To protect them the British have built as many as three armored decks. The *Nelson, Hood,* and *Rodney* have armored decks, and it is entirely probable that the two ships of the *Renown* class, the *Tiger,* the five *Royal Sovereigns,* and the five *Queen Elizabeths* also have three armored decks."

Twelve of our eighteen ships compare favorably with Japanese and British ships as regards deck protection. The remaining six ships have insufficient deck protection. The British provided some additional deck protection as a result of Jutland. Nothing definite is known of the Japanese in this respect. Second and third sentences are correct.

8. "The Japanese, too, have modernized their ships in this respect. Two of Japan's capital ships have three decks of armor; two others have two decks. We, however, have only one deck armored as protection against the long-range gun and the aerial bomb."

Nothing definite is known as regards the Japanese in this respect. (See comment under paragraph 7.)

9. "Even if we were on equal terms we could be destroyed by our failure to provide sufficient armored decks. But we are not even on equal gun terms. The average range of the twenty-two British ships is 24,967 yards, practically 25,000 yards; while the average range of our capital ships is 23,333 yards. We could be blown out of the water by the British without even hitting the target. They could stand off out of range and do it.

"Marked deficiency in speed.

"It is true that we have five ships of equal range with the British. These are the two ships of the *California* class and the three ships of the *Colorado* class. They have a range of 30,000 yards and they would have to do all the fighting, because every other ship in the British Navy—nineteen of them—outrange every other ship of the American Navy. And that is not all. While the *California* and the *Colorado* ships have the same range as the *Hood* and the two *Rodneys,* those ships could sail circles around ours, for the *Hood* makes 31 knots and the two *Rodneys* make 30. Against this none of our ships can do better than 21."

First paragraph. As to our needs in armored decks, see paragraph 7. As to equal gun terms the facts are: We have five ships which are superior in range to eighteen British ships. These five are about equal in range to two British ships (*Rodney* and *Nelson,* under construction).

The British capital-ship fleet enjoys a very marked superiority in the number of ships that may be brought into action at the moderate and

decisive ranges between 21,000 and 24,000 yards. This superiority is shown in the following table:

Range in yards	British ships in action	American ships in action
24,000	13	10
23,000	20	10
22,000	20	12
21,000	20	18

The statement as to average gun ranges means nothing, as a few ships with extreme ranges are averaged in with a greater number of ships with low ranges. The figures above give more information.

As to speed, the British have five battleships that make 4 knots greater speed than the fastest American battleship, and four battle cruisers that can make from 9 to 10½ knots greater speed than the fastest American battleship. Our lack of battle cruisers of high speeds is because we have deemed it more prudent to place the money available in the more powerful battleships with less speed and heavier armor, hence greater vitality.

Mr. Shearer gives a table of ranges as follows:

10.

BRITISH

Class	Number of ships	Speed	Caliber of guns	Range
			Inches	
Tiger	1	30	13.5	23,800
Iron Duke	4	22	13.5	23,800
Renown	2	30	15	24,300
Royal Sovereign	5	21	15	24,300
Queen Elizabeth	5	21	15	24,300
Glorious	2	30	15	24,300
Hood	1	31	15	30,000
Rodney	2	30	16	30,000

UNITED STATES

Class	Number of ships	Speed	Caliber of guns	Range
			Inches	
Utah	2	21	12	20,000
Wyoming	2	21	12	22,000
Texas, Arizona and Nevada	6	21	12	20,000
New Mexico	3	21	14	22,000
California	2	21	14	30,000
Colorado	3	21	16	30,000

"WOULD BLOW US OUT OF THE WATER"

"You can see by those figures, * * * that it would be five ships against twenty-two. They would blow us out of the water.

"Then consider the element of speed. The *Hood* makes 31 knots; the two *Rodneys,* the two *Glorious* class, the two *Renowns,* and the *Tiger* make 30; the five *Queen Elizabeths* make 25. In other words, one makes 31 knots; seven make 30 knots, and five make 25 knots. Against that what have we? Not one of our eighteen ships can make better than 21 knots. What is more, the British engines are built to make a knot or two more than their designed speed. Our ships are not. In fact, when they don't come up the the designed speed in their trials, Congress helps the contractors out and accepts them anyway. The shameful thing about it is that, while our eighteen capital ships have designed speed of 21 knots, four can do only 16 knots, and six can not make more than 12 knots. On paper the *Pennsylvania,* the *Arizona,* the *Oklahoma,* and the *Nevada* make 21 knots; actually they do only 16. On paper the *New York,* the *Texas,* the *Utah,* the *Wyoming,* the *Arkansas,* and the *Florida* can make 21 knots; actually they are all coal burners and can make only 12 knots.

The above tables are incorrect in many places as to ranges. For comparison of ranges see statement under paragraph 9 above. The statements as to speed of four United States ships being reduced to 16 knots and six ships reduced to 12 knots, are not correct. The speeds are as indicated below:

BRITISH

Class	Number of ships	Speed
Tiger	1	30
Iron Duke	4	21
Renown	2	31.5
Royal Sovereign	5	23
Queen Elizabeth	5	25
Hood	1	31
Rodney	[1] 2	[2] 23

[1] Latest design. [2] Estimated.

UNITED STATES

Name of ship	Speed	Name of ship	Speed
Colorado	[1] 21.15	*Pennsylvania*	[1] 21.33
West Virginia	[2] 21	*Nevada*	[1] 20.81
Maryland	[1] 20.84	*Oklahoma*	[1] 20.60
Tennessee	[1] 20.86	*Texas*	[1] 20.46
California	[1] 20.87	*New York*	[1] 20.91
Idaho	[1] 21.26	*Arkansas*	[3] 21.00
New Mexico	[1] 20.90	*Wyoming*	[3] 21.00
Mississippi	[1] 21.01	*Florida*	[4] 12.00
Arizona	[1] 21.30	*Utah*	[3] 21.00

[1] Last full power runs.

[2] Trial speed.

[3] Estimated when repairs are completed.

[4] Present speed. Awaiting funds for new boilers.

The statement that the British engines are built to make a knot or two more than their designed speed is not confirmed by our information.

All of our ships at present can make their designed speeds, or practically so, except the *Utah, Arkansas, Wyoming,* and *Florida.* The boilers of these ships have through long use become deteriorated. They have recently been sent to navy yards to undergo repairs, which will be completed, except for the *Florida,* by July 1, 1924. These repairs place these vessels again in the battle line for a time.

The following record of time spent by them in navy yards for repairs during the last two fiscal years is indicative of their condition:

CALENDAR DAYS AT YARD FOR REPAIRS

Ship	1922	1923	Total
Florida	49	267	316
Utah (abroad)	None	126	126
Wyoming	110	103	219
Arkansas	110	193	303

The *Florida* can make now only 12 knots. Her repairs are held up pending the decision of Congress relative to her modernization.

The complete reconditioning of these four vessels is essential.

11. "Far below treaty strength.

"'Now, consider the light cruiser situation. The British are five to one better than us, and the Japanese two and one-half to one. An official memorandum of the Navy Department shows that the three navies stand this way:

LIGHT CRUISERS NECESSARY TO BRING UP TO 5–5–3 RATIO

	Number of ships	Tonnage
United States	19	187,883
British Empire	7	72,093
Japan	None	None

"'That table shows that the Japanese are up to strength and we are nineteen ships below strength. The Navy Department knows it can not get nineteen fast light cruisers, however, so it has asked for eight. It expects to get none.

"'Back in 1916 we authorized 10 cruisers. That was the year before we entered the war. Of those ten, seven have been built. Three have not yet been completed and before they are launched they are out of date. It is just that sort of thing that has turned the 5-5-3 ratio into a 5-3-1 ratio, with America 1.'"

For a comparison of cruiser ratio see comment under paragraph 3, page 1156.

On the basis of comparing the displacement tonnage of light cruisers less than twelve years old and of 25 knots or greater speed, Mr. Shearer's table is incorrect. It should read as follows:

LIGHT CRUISERS

Ships necessary to build to bring up to 5-5-3 ratio in displacement tonnage in addition to ships now built, building, or appropriated for.

	Number of ships	Tonnage
United States	[1] 21 [3] 22	[2] 210,000 .....
Great Britain	None	None
Japan	None	None

[1] 10,000 tons.

[2] On basis of present Japanese tonnage.

[3] On basis of British tonnage, including five new ones in 1925 British estimates.

This table shows that at the present date (April 8, 1924), we require twenty-one 10,000-ton cruisers to obtain a 5-5-3 ratio with Japan and need twenty-two 10,000-ton cruisers to obtain an equality or 5-5 ratio with England (on tonnage basis). As these ships would be larger and more modern than the majority of the corresponding units in the British and Japanese Navies, this would give us a preponderance in cruiser strength if all were completed as of today. All nations, however, have cruiser building programs, and this nation should map out a program for the future, with the end outlined above in view.

12. "Now consider the destroyer situation. The British have 170 destroyers in service. The Japanese have 69 destroyers in service. We

have 107 or 108 destroyers in service. The rest of our destroyers, some 225 or 230 of them, are tied up, hull to hull, and bow to stern, in Philadelphia and other places, just like the Shipping Board vessels you can see up the Hudson, and you know what is happening to their machinery all this time.

For the comparative situation as to destroyers, as of data obtainable on October 1, 1923, see paragraph 3, page 1156.

13. "Personnel drops off.

"'To illustrate the condition of the destroyer fleet let me go back to just after the war. We had a great number of destroyers at Newport then. It was announced that they would be taken to Charleston, S. C., for winter quarters. Do you know how that was done? Six officers and about forty men boarded a destroyer and made a daylight run to Charleston. Then they tied her up, came back by train and took another destroyer down. That is how the entire lot was moved, but the public never knew it.

"'And the reason for this is that we have let our personnel drop off.'"

This method of moving destroyers was employed because there was not sufficient personnel to man all of them. Whether or not the exact number of men stated took destroyers from Newport to Charleston just after the war in the manner stated is not known.

14. "In personnel we are nowhere near the 5-5-3 figures. We have 7,500 officers and 86,000 men; we should have 12,585 officers and 97,125 men. The British are practically up to strength and the Japanese are up to strength with 7,550 officers and 58,274 men."

The situation as to personnel is as follows:

	Great Britain	United States	Japan
Active Navy:			
Enlisted men	91,397	86,000	58,274
Officers	8,571	7,821	7,550
Enrolled reserves and retired Navy:			
Enlisted men	62,626	24,173	[1] 31,419
Officers	9,843	6,193	.....

[1] Total officers and men.

As to Mr. Shearer's statement as to the number of men we should have, the Navy Department has frequently recommended to Congress the numbers necessary to carry out our plans and to maintain our policies.

15. "We have no bases of operations and virtually no fuel oil in reserve. Actually all the fuel oil stored above current needs is 1,500,000 barrels at Pearl Harbor, Hawaii. Our Navy uses about 8,000,000 barrels a year, and in war we would use about 40,000,000 barrels. And all we have is an infinitesimal amount at a point 2,100 miles off our shores."

This statement is not strictly correct. We have no operating bases in the Pacific that are adequate. The Atlantic bases are better, but are not nearly all adequate. As regards petroleum reserves, we have a deficiency of sixty-eight per cent in the reserves required in the Pacific: i.e., thirty-two per cent only of the necessary reserves is on hand. The Atlantic reserve deficiencies are still greater. The reserve at Oahu on January 1,

1924, was about 1,759,667 barrels. In a Pacific war the Navy will use about 70,000,000 barrels during the first year of war.

16. "Fleet in poor condition.

" 'Finally, the fleet is in poor condition. Congress has failed to provide funds to keep it in shape. The Atlantic Fleet is practically out of commission. The recent maneuvers had to be broken off because the *Wyoming*, flagship, *Arkansas*, *Utah*, and *Florida* needed to undergo repairs. They are tied up now. Their boilers are in bad shape and there is no money to do the work.' "

It is a fact that the *matériel* of the fleet is generally deteriorating, due to age and lack of funds to make all current repairs required. The bill as reported to the House this year carried an increase in the appropriation under engineering to be applied to remedy in part this deficiency. Also the bill reported by the House Naval Affairs Committee authorizing certain modernization in the older battleships has this end in view.

17. "So that the situation is just this: Not only are we outgunned and outmanned, as I pointed out in yesterday's article, but we have failed to modernize our ships as well. England and Japan have blistered their battleships. That means they have given them further protection against torpedo attack, added to their fuel capacity, and greatly increased their cruising radius. We have done nothing."

These statements have been commented upon, separately, in the foregoing paragraphs. As to the last sentence, authority for the modernization of six battleships has been asked for in this Congress. The Secretary of the Navy in his annual report for 1923 recommended an appropriation of $30,000,000 for complete modernization of battleships.

18. "England outranges us two miles. When the Japanese have finished elevating their guns they will in some classes outrange us five miles. England has provided adequate deck armor against long-range guns and aerial bombs. We have done practically nothing."

See comments on paragraphs 7 and 9.

19. "Japan is up to the treaty's equivalent standard on light cruisers. England nearly so, while we are far behind, and those that we are building are out of date before they are launched."

See comparisons of cruisers, page 1156.

20. "Japan is up to the treaty's equivalent standard in destroyers, England is behind but better than we, and we have two-thirds of our destroyers tied up and falling to pieces."

England has 196 destroyers manned with full or reduced crews, the United States has 109, and Japan 63. For comparison as to total number and ratios see page 1156.

21. "In personnel Japan is right up to strength, to the last officer and the last man; England is nearly up to strength, while we are 5,085 officers and 18,525 men under strength. Actually it is more than that, because our Navy, besides being a fighting force, has to maintain a thousand and one things, from a radio communications service to looking after lepers."

See comment on paragraph 14.

22. "It all shapes up this way: We have scrapped our ships, we have scrapped our treaty, and we have failed to modernize. The naval ratio today instead of being 5-5-3 is 5-5-1 and we are 1."

This statement is greatly exaggerated. Plans have been prepared for the complete modernization of our battleships, as recommended in the Annual Report of the Secretary of the Navy, to cost $30,000,000. Authority for modernization of the six coal-burning battleships has been requested of the present Congress. The department asked authority of the present Congress to build eight 10,000-ton light cruisers; also for funds to build three mine-laying submarines.

As to the last sentence, it is difficult to definitely state our exact strength due to the varying ratios in the different types. A fair approximation may be obtained by study of the ratios for the various types in paragraph 3. A fair comparison of the present fighting strength in ships of Great Britain, America, and Japan would appear to be 5-4-3. This ratio does not take into consideration strategically located and well equipped naval bases which add greatly to the sea power of a nation, nor does it take into consideration the relative strength of the various merchant marines.

The Navy is in good shape with the exception of the above designated deficiencies, which should be remedied. The morale of the personnel, both commissioned and enlisted, is high. The appropriations furnished by Congress are being applied in such manner as to obtain the very best results.

ENGINEERING

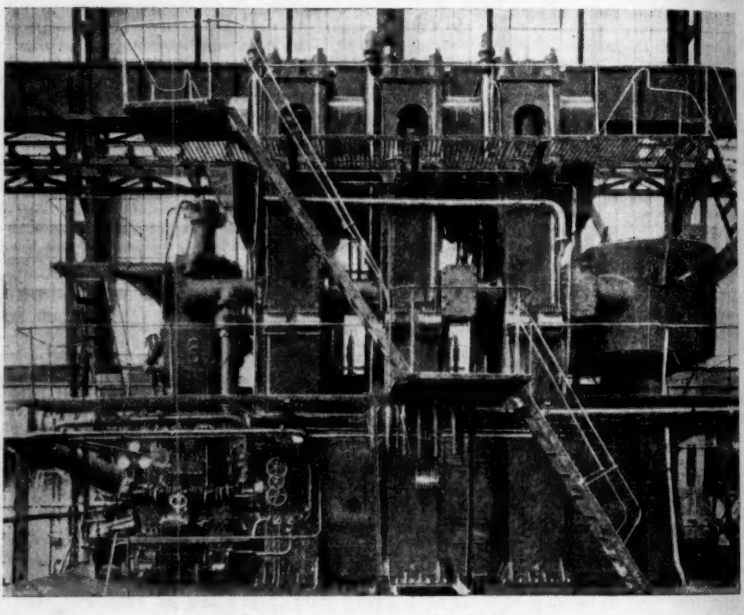
A Sliding Cylinder Two-cycle Double-acting Marine Oil Engine

The Engineer, 25 April, 1924.—At various times we have made reference in these columns to a new two-cycle double-acting marine oil engine which has been designed and built at the North British Diesel Engine Works, Limited, Whiteinch, Glasgow. Although completed last year, the intervening period has wisely been spent in carrying out careful trials, which culminated in a series of demonstration trials which were concluded some days ago. On Tuesday, April 15, Mr. J. C. M. Maclagan, to whose inventive ability many of the new features of the engine are due, gave a paper before the Institution of Engineers and Shipbuilders in Scotland, in which the engine and the various problems which have arisen during the period of its design and construction, are described. The paper referred to is very complete, and it gives in detail a great deal of the experimental work which has been done during the development stages, with accompanying tables and curves. Further particulars are also included of the installation of this first large unit on the cargo steamer *Swanley*, built for Harris and Dixon, of London, by Barclay, Curle and Co., Limited, of Glasgow, which vessel is now fitting out at Whiteinch. Trials of this ship will, it is expected, take place shortly, and we then hope to give an account of the ship and its performance. In the present article references will be made more particularly to the working principle of the engine and some of the details of its construction.

The drawings which we reproduce below are partly diagrammatic, but they will serve to indicate the working principle. A view of the engine on the test bed is also given. The leading particulars are as follows: Total designed output, 2,000 brake horse-power; revolutions per minute, 100; number of lines of cylinders, three; diameter of cylinders, 22½ inches; stroke of piston, 44 inches. Referring to the drawing, it is to be noted that three sectional views are given. That to the left hand is an athwartship section through the engine; the center view a longitudinal section; and the right-hand view a further athwartship section showing an external view of one engine. From these illustrations, it will be seen that each cylinder line comprises an upper and a lower cylinder, both of which are open at either end. The cylinders, together with their respective water jackets and the attached scavenge air and exhaust branches, are free to reciprocate relatively to the two cylinder covers, which are provided at the outer ends of the cylinders. These covers are made in the form of stationary pistons, and are furnished with spring piston rings, in order to ensure gas-tightness. The upper and the lower cylinders are connected to each other by two ties placed diametrically opposite to each other. Between the covers and inside the cylinders there is a double-ended piston with a gudgeon pin having extended ends passing out between the upper

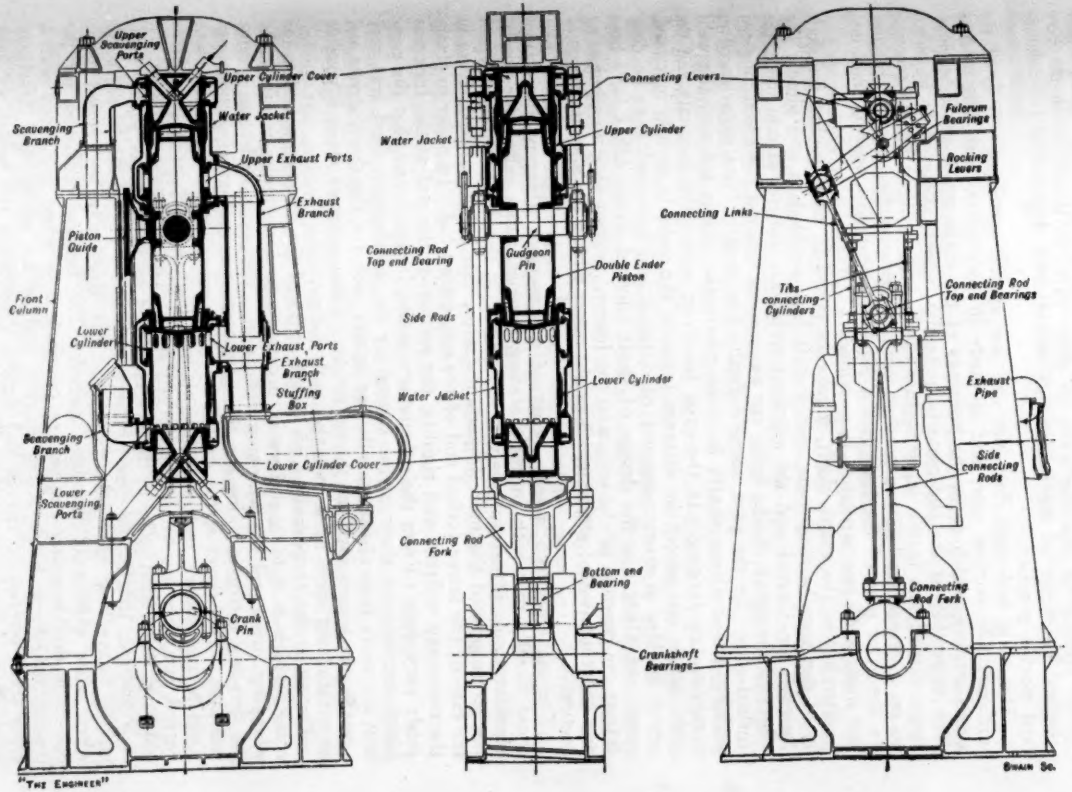
and the lower pistons, sufficient space between the cylinders being left to accommodate the movement of the piston. At each end of the extended gudgeon pin there are journals provided, which take the top end bearings of the main connecting-rod. Side connecting-rods extend downwards from the top end bearings, and at their lower ends are attached to the connecting-rod fork. The connecting-rod fork carries a crank pin bearing of usual construction, and crank shaft bearings on either side of the crank web support the main crank shaft. The middle of the piston is furnished with a slipper guide, having ample bearing surfaces, which is supported on one side of the main columns.

The two cylinders, along with their respective water jackets, scavenging and exhaust branches, are caused to reciprocate by the link gear illustrated



2,000 B. H. P. Marine Oil Engine

in the drawing above. Connecting links are attached at their lower ends to the extended portions of the main gudgeon pins, and at their upper ends to journals provided at the extreme ends of the cylinder operating levers. Actually, the cylinders are given a reciprocating motion by means of further links attached to intermediate points on the rocking levers. These turn about fulcrum bearings, and the gear is so designed that the main cylinders, together with their water jackets, reciprocate synchronously with the main piston, but through a much smaller distance. Thus the scavenging ports provided at the outer ends of the cylinders are uncovered by the relative movement of the cylinders to the cylinder covers, while the exhaust ports, which are arranged at the inner ends of the cylinders, are uncovered by the relative movement of the piston to the cylinders. The front column of the engine is made hollow, and serves as a scavenge air reservoir, it being furnished with appropriately designed stuffing-boxes to accommo-



SECTIONS THROUGH TWO-CYCLE SLIDING CYLINDER MARINE OIL ENGINE

date the sliding scavenging air branches. In a similar way, the exhaust manifold has a stuffing-box to take the sliding exhaust branch.

Having given a brief account of the essential parts of the engine, it may be of interest to describe some of these parts in detail, since the very original character of the engine has necessitated departures from standard marine practice.

The main bed-plate does not call for special comment. It is of the ordinary box-section type, and is made in two parts, with intermediate cross girders, which form the housings of the main crank shaft bearings. The underside of the bed-plate is quite flat, which allows it to be bolted down directly on to the inner bottom of the ship without having recourse to an intermediate built-up seating, with a corresponding loss of rigidity. In the after part of the bed-plate a Michell-type thrust bearing built into the main bed-plate structure is provided.

Turning to the crank shaft, it may be noted in passing that the shaft is of the semi-built-up type, and that it is assembled in one piece. The journals, or journal and the adjacent webs, are forged in one piece, the edges of the crank checks being cut away so as to clear the connecting-rod forked-ends. In the past, some difficulty has usually been experienced in making semi-built-up shafts in cases where the crank pin and the webs comprise one forging. In the case, however, where the journals and the webs are in one piece, the distance between the webs is greatly increased, which enables a greater amount of forging and hammering to be done round the fillets. In the design of shaft adopted, large fillets have been left at the junction of the web, and the journal, with a view to eliminating any concentration of stress which might occur with a too abrupt change of section.

The main connecting-rods, being of a somewhat different form from those usually met with in reciprocating engines, have called for special consideration and careful analysis in design. In this instance, rigidity and not stress proved the more important factor, this being particularly so in the case of the lower forked end of the connecting-rod. In order to obtain the necessary stiffness and rigidity, the section of the rod at the fork was made very deep. From the calculations made, it was found that the combined tension and sheer stress caused by the combustion load was very low, not more than about 2,000 lb. per square inch for the down stroke and 1,802 lb. per square inch for the up stroke. These stresses made it possible to utilize cast steel as a material with safety.

Owing to the abnormally high length ratio of the connecting-rod to the crank, which is 8 to 1, it became necessary to investigate carefully the whipping stress and the whipping deflection. Whipping deflection became the deciding factor in fixing the size of the various sections of connecting-rod arm. The direct stress caused by the combustion load is only about 2,560 lb. per square inch, which, although it is subject to a partial reversed, is a very low stress for forged steel. The whipping stress, on the contrary, was found to be in the neighborhood of 4,050 lb. per square inch. It is probable that in the case of the engine under review, these parts are unduly heavy, but we understand that the sizes may be revised later, when more experience has been gained. The bearing pressures for the two-cycle double-acting engine are relatively low when compared with a typical four-cycle single-acting engine, and in his paper Mr. Maclagan gives some interesting curves and figures illustrating the points we have referred to. Curves are also given showing the reaction on the piston guide slippers, which is correspondingly low. One of the interesting features of the sliding cylinder engine which the makers claim, is that it will accommodate itself more readily to wear than will the guide shoes of any other type of engine. Thus, with a uniform diametrical clearance of twenty-thousandths of an inch between the piston and the cylinder, and a

similar clearance between the cylinder cover and the cylinder, the guide shoe would require to wear forty-thousandths before the piston would begin to press heavily on the cylinder walls. In a fixed cylinder engine, with equal cylinder liner clearance, the piston would press against the cylinder walls when the wear on the crosshead guide had exceeded twenty-thousandths.

Contra and Guide Propellers

The Nautical Gazette, 3 May, 1924.—An invention, which as yet has been put to little practical use but which has many possibilities, is the guide propeller developed by Professor Hass. The Wagner contra-propeller has already been commercialized in Germany, but the Hass device differs in several respects from the contra-propeller.

Experiments with the Hass invention were made with a model of a 6,000-ton displacement motorship in the Hamburg Experimental Institute, and it was found that at a speed of 12 knots the ordinary propeller required 2,223 s.hp., the four-blade contra-propeller 2,076 s.hp., and the two-blade Hass guide propeller only 2,027 s.hp. The use of the latter therefore, effects a saving of about nine per cent.

The difference between the Wagner and Hass systems is that in the former the contra-propeller is placed behind the driving propeller and in the latter the guide propeller is placed before the driving propeller. The action of the Hass guide propeller is to impart a rotary motion to the water, opposite to that of the driving propeller so that the stream lines of the water are made uniform before reaching the propeller, whereas ordinarily the water reaches the propeller with a non-uniform flow and with eddies. The stream leaving the propeller now no longer has a rotary motion in the direction of that of the driving propeller, but leaves it with straight parallel stream lines.

The energy uselessly expended in imparting a rotary motion to the water leaving the propeller is thus recovered. This is evidenced in the saving in power in the main engine.

The two-blade construction which, as was noted from the test data, gave the greatest saving in power has not only the advantage of being easily installed, but also makes for greater safety in that no interruptions in service are possible due to the entrance of foreign bodies.

No further saving was effected by installing the Wagner contra-propeller behind the driving propeller with the Hass guide propeller before the driving propeller. In all tests, however, an increased effectiveness of the rudder was noted. Since the rudder, in itself, works the better the more it is inside of the propeller stream, it is easily seen that the rudder action must be better if the propeller stream becomes more uniform and direct.

Effect of Diesel Engines on Ship Design

The Nautical Gazette, 3, May, 1924.—Long after steam had superseded sail, the old sailing ship hulls continued to be built and the engines installed, and in an analogous sense the same is obtaining in the transition from reciprocating to internal combustion engines, says a writer in *Shipping World*.

The development of the oil engine presents a suitable opportunity for reconsidering the form and design of cargo vessels entirely. One frequently hears the remark that by fitting internal combustion engines the owner will save a considerable amount of the machinery space and have this space available for cargo-carrying purposes. If this saving be availed of, then part of the opportunity above referred to will be lost.

The oil engine calls for a finer ship, and it will be found advantageous to reduce the block coefficient by the amount of saving on the machinery

space. Take, for instance, two ordinary large cargo carriers 400 feet long, 10½ knots speed and block coefficients of .77. If Diesel engines were required in one of them and reciprocating in the other, the former would show a saving of roughly 18,000 cubic feet in the machinery space. Now, instead of adding this to the available cargo space, the naval architect would be well advised to employ it for the purpose of lessening the fullness of the ship, and 18,000 cubic feet used in this way would reduce the block coefficient from .77 to .73. This would give the vessel better light service and normal draughts and therefore make her a better sea boat. She would be an easier ship to drive, have an increased range of speed, and would be more economical in service as regards consumption, and there would be no increase in the tonnage dues as compared with the reciprocating-engined ship.

The oil engine is not so resilient as the reciprocating engine in taking shocks and overloads, and the design of hull, therefore, should be such as to lighten the work of the engine to the greatest possible extent.

From these considerations it would appear that the first incidence of the internal combustion engine on the design of ships will be to provoke finer forms, and no sooner will this come into operation than a process of increasing speeds will be inaugurated, a process long overdue. The nine and ten-knot cargo tramp is out of harmony with the necessities of the age, and if that class of vessel is going to recapture any of its lost power, speed more in line with the traffic liner will be necessary.

Twelve knots minimum speed and .7 maximum block coefficient may probably in future years make quite a useful basis of cargo ship design.

The Future British Naval Engineer

Army, Navy and Air Force Gazette, 26 April, 1924.—A correspondent who writes to us on the subject of the decision to increase the number of special entry cadetships in June, and to require candidates to express their preference for engineering or executive cadetships, suggests that this step is fundamentally opposed to the principle on which the Selborne-Fisher scheme was started in 1903. Yet it is less at variance with that principle than the more important, and, as many think, retrograde step taken some time back of withdrawing the option for engineers to revert to the "line." Common entry, and common education as cadets, still remains. But the idea that it should be at least possible for an engineer officer with the necessary aptitude and knowledge to rise to a seat on the Admiralty Board, or to command a fleet, has been abandoned. Very few might ever have done so, but there was, at any rate, the prospect before them. This is not the case now. A navigator, after twelve or fifteen years in navigating ships, may advance in the general Service and attain the highest posts, but not so the officer who spends a similar period in charge of a ship's machinery. Yet much depends upon the man, and it may well be that in time a rear admiral (E) will have so strong a claim to a seat at the Admiralty that it cannot be resisted.

AERONAUTICS

Germans Proud of Building "ZR-3" for the United States

U. S. Air Services, May, 1924.—An article in the *Cologne Zeilung,* a conservative newspaper published in the British occupied territory, on the building of the Zeppelin airship *ZR-3* for the United States is informative, though written with a keen sense of pride in the construction of the ship. The writer lays immediate stress upon the assertion that "this is a vessel nearly two and one-half times as large as Germany can build for herself, and there is a proviso that the vessel shall not be employed for military purposes." The essential parts of the article are selected for use in the following abstract:

This ship was to embody all modern inventions and improvements in airship construction, especially the latest provision for stability and safety. The vessel will have the same dimensions as the last German Zeppelin built just before the end of the war. The *ZR-3* is designed mainly for passenger service, and for that reason comfort, stability, and safety have received special consideration. Its principal dimensions are as follows: Length, 200 meters; maximum width with propellers horizontal, 27.64 meters; maximum height, including the gondola buffers, 31 meters.

But mere figures like these give no adequate idea of the gigantic dimensions of this great passenger ship. As a matter of fact, no vessel as large as the *ZR-3* has ever hitherto been launched. Two thousand horsepower is required to drive this vessel through the air at a speed of eighty miles an hour. This is furnished by five 400-horsepower Maybach motors. Each is in a special motor-gondola. These gondolas are distributed on the outer side of the vessel, and are lashed to the skeleton with steel cables.

The engines, which have been designed by a subsidiary company of the Zeppelin Corporation, represent a complete innovation in motor construction, besides incorporating a large number of improvements in the finer details. They are designed mainly to insure uninterrupted operation, unusually long life, and reliability on protracted voyages. Each consists of twelve cylinders pitched in gable form. Among other innovations, the motor itself is reversible. This dispenses with the heavy reversing gear, and ability to reverse the five motors simultaneously enables the navigator to stop the vessel very quickly. The idea of reversible motors was developed during the World War for United States submarine chasers, but this is the first time it has been applied to an airship.

Numerous technical improvements, the result of twenty-five years' constant study and experience in this line of construction, are also incorporated in the vessel itself. The passengers' and officers' quarters of the *ZR-3* have accommodations for thirty people, and are as luxuriously designed and furnished as the best cabins on the finest ocean-steamers. The day saloon, which can be converted into sleeping quarters at night, resembles in general arrangements a Pullman car. It is in the main gondola, which is rigidly attached to the forward keel of the vessel. The same gondola contains a kitchen with an electric range.

The saloon has five compartments, each providing ample room for six persons. Large windows give an uninterrupted view on either side and below. In fact, the passengers will enjoy the most luxurious conditions of travel that modern science has as yet devised. There will be no vibration, no seasickness. The motion of a vessel of these dimensions is practically imperceptible.

The quarters for the crew, which will consist of some twenty-four men, resemble those of soldiers on a transport during the war. Tiny cabin berths are provided for them on either side of a long gangway that passes through the whole vessel. These cabins are so placed that the engine-room staff and the other members of the crew sleep in the immediate vicinity of their posts of duty.

The *ZR-3* is provided with a device that will permit her to be moored to masts; since it is the opinion in the United States that mooring masts will be generally adopted as soon as rigid airships come into common use.

About 300 tons of coal will be consumed to manufacture the 70,000 cubic meters of hydrogen used to fill the vessel. Several short trials will be made, and a longer flight of twenty-fours hours, in order to give the motors and other machinery of the new vessel a thorough, practical test. Some of these trial trips will be purposely made in bad weather.

The *ZR-3* bears the construction number 126; so it represents the experience and progress embodied in one hundred and twenty-five predecessors.

But the great test will be the delivery of the vessel from Europe to America. The distance in a direct line from Friedrichshafen to the east coast of North America is 3,500 nautical miles, while the distance traversed by the *R-34* in its journey to America from Scotland was only 2,800 nautical miles.

We are all familiar with the fact that violent western gales prevail on the North Atlantic throughout the winter. During these months the average velocity of the western wind at the surface of the sea exceeds in these localities forty feet a second. At the height that an air vessel will maintain, this velocity will probably reach fifty feet a second; for experience shows that the strength of the wind is considerably greater in the higher altitudes than at sea level. Consequently the velocity of the western wind must be subtracted from the speed of the vessel. If the latter averages 100 kilometers, or roughly sixty miles an hour, for the voyage, it would therefore take the *ZR-3* 140 hours to make the trip.

For this reason a more southerly route may be selected, approximately along the thirtieth parallel. This will mean a course from Friedrichshafen over southern France, leaving the continent above Cape Finisterre, passing the Azores, and continuing across the Atlantic south of the Bermudas. Such a course will be one third longer—about 4,500 nautical miles in all. Yet even under these conditions the builder's plan is to deliver the boat at its destination in from 75 to 100 hours—that is, in from three to four days.

Since the journey is not to be interrupted by intermediate landings, the crew will consist exclusively of veteran Zeppelin navigators, and will number about thirty persons. Gasoline for fuel alone will weigh thirty-three tons—that is, about the contents of three European railway tank-cars—without including oil, spare parts, water ballast, and provisions.

To illustrate what such an air vessel can do in regular service, let us take, for example, the trip from San Francisco to Honolulu, which is slightly over 2,000 miles. A passenger steamer requires five days to make it, while under favorable weather conditions an air vessel can reach Honolulu in a little over twenty-eight hours, and return in thirty-six—allowing for normal prevailing winds. Consequently a person could leave San Francisco early Saturday morning, arrive in Honolulu Sunday forenoon, spend the better part of the day in the latter city, return on the evening boat, and be in San Francisco again Tuesday morning. On such a trip the vessel would carry in addition to thirty passengers about fifteen tons of freight and mail.

By arranging the schedule so that the airship connected at Honolulu with a vessel for the Orient, four days could be saved in the journey from San Francisco to Japan, China, or Manila.

Let us put it another way. If a vessel were employed in transcontinental service, the round trip from New York, St. Louis, Los Angeles, and San Francisco, returning via Chicago to New York, would require about four days of actual traveling. If the vessel carried no passengers, but merely full ballast and operating supplies, its radius of action at an average speed of sixty miles an hour would be nearly 10,000 miles. Substracting one eighth from this amount for possible unfavorable weather conditions, such a vessel could reach any point within 8,000 or 9,000 miles of New York. This would place within its range Hongkong, Colombo, Cape Town, The Antarctic Continent, Auckland, Manila—in fact every important seaport in the world except those in Australia.

New Dirigible "ZR-3" Will Have Brakes

Philadelphia Public Ledger.—Lakehurst, N. J., May 13.—Brakes on an airship with five 400-horsepower engines that will run forward or reverse without reverse gears will be introduced into the United States when the

new German-built Zeppelin *ZR-3* flies from Friedrickshafen to Lakehurst, a distance of 4,500 nautical miles, this summer.

With powers of braking and reversing the motors, naval officials said today the *ZR-3* could easily be put to her mooring mast and slowed down when running before a strong wind.

Captain Ernest A. Lehmann, who came to the United States to arrange for the delivery of the ship, said the *ZR-3* the finest and most efficient of 126 airships built by the Zeppelin Company, would revolutionize commercial aviation in this country.

More than forty-four tons of useful load can be shot through the air at eighty miles an hour by the *ZR-3* he says, while ten or fifteen tons cargo can be taken on long-distance hauls. Provision has been made for thirty passengers and baggage.

ORDNANCE

Naval Gunnery Records

Army and Navy Register, 26 April, 1924.—Scores for all target practices in the battleship class since the beginning of the gunnery year to this date have been worked out in the office of the director of fleet training, and the leading vessels stand in the following order: *Maryland, Tennessee, Pennsylvania, Mississippi, Arizona,* and *New Mexico.* This standing is based on short-range practices, night practices, and torpedo firing, and they have a weight of fifty. The practices yet to be fired have the same weight, and the relative standing of vessels may be altered materially by the end of the gunnery year. The standing of battleships in torpedo exercises for this gunnery year has been ascertained to be as follows: *Tennessee, Arizona, Idaho, California, Oklahoma, Nevada, New Mexico, Pennsylvania, Texas, Maryland, Mississippi,* and *New York.* The cup presented to the Navy by the American Defense Society and awarded annually to the vessel of the battleship class making the highest merit at short-range battle practice has been awarded for this gunnery year to the *Pennsylvania.* That vessel also has been awarded the Spokane cup, presented to the Navy by the Chamber of Commerce of Spokane, Wash., and awarded annually to the vessel of the battleship class making the highest merit with turret guns in short-range battle practice.

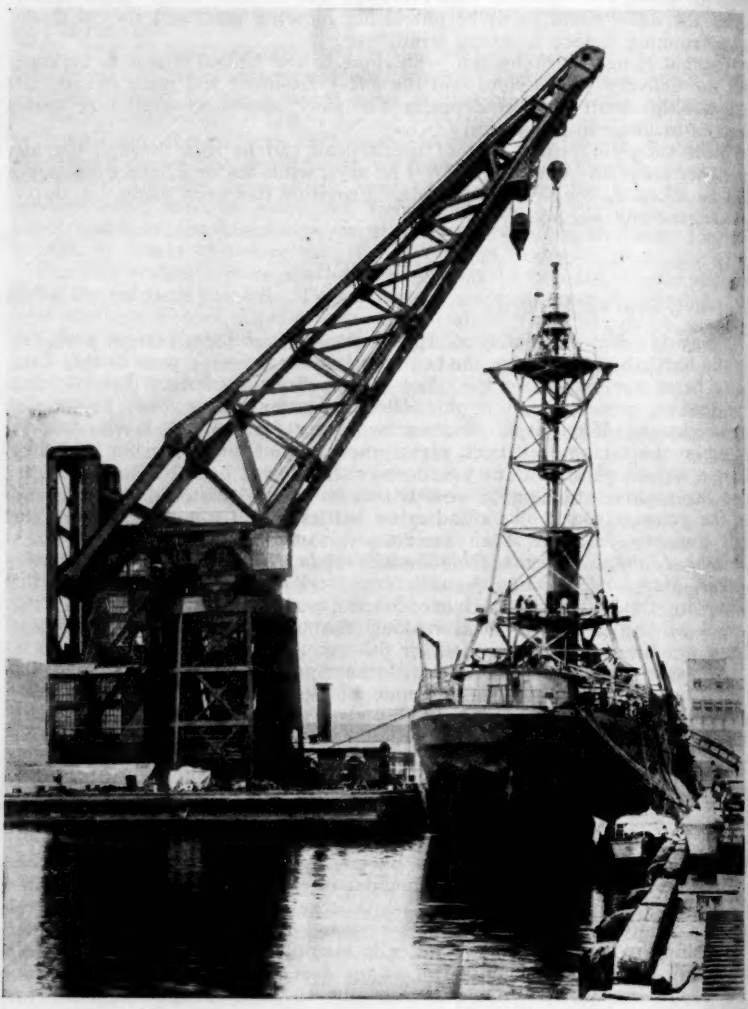
Admiral Coontz for Gun Elevation and Warship Modernization

Army and Navy Journal, 3 May, 1924.—The deficiencies in the fleet, which in the recent maneuvers demonstrated that the American Navy is now actually below the treaty ratio, have been reported to the Navy Department by Admiral Coontz, commander-in-chief of the United States Fleet. Not only does Admiral Coontz urge the elevation of the turret guns of eleven of the older battleships and the conversion of the older battleships to oil burners, but he calls attention to the striking weakness of the air force and the submarine of the fleet. He describes a deteriorating conditions of the ships which is due to lack of appropriations for maintenance of the fleet. Radio communication and facilities for it are inadequate, he declares.

In his report, Admiral Coontz urges the general tuning up of the units of the fleet, but emphasizes the importance of modernizing the battleships and the development of submarines which can operate effectively with the fleet. He declares that the submarine operations were the worst of all the combat ships.

In the course of his report Admiral Coontz said:

"In one of the problems during the maneuvers off Culebra the fleet speed contemplated was 10 knots, which had to be reduced because of slowness of auxiliary ships.



THE WORLD'S FIRST AIRSHIP TENDER, THE U. S. S. "PATOKA," RECEIVES THE MOORING MAST ON MAY 5, TO WHICH THE NAVY'S AIRSHIP "SHENANDOAH" CAN BE MOORED. WHEN OPERATING WITH THE FLEET THE U. S. S. "SHENANDOAH" WILL MOOR TO THE MAST ON THE U. S. S. "PATOKA" WHILE TAKING ON FUEL AND SUPPLIES

"The condition of *matériel* of the fleet is not as good as it ought to be. There is what may be called a deferred maintenance, resulting from the Navy's inability to keep the ships properly repaired and up to date in the way of beneficial alterations, due mostly to insufficient appropriations. Under present conditions it will require a long time to overcome this so-called deferred maintenance.

"Lack of destroyer leaders has been keenly felt in all the problems. A destroyer squadron commander has a very considerable task, for present destroyers used as flagships have not that excess of offensive force, speed and reliability which they ought to have in order to lead. A commander is crowded to a degree incompatible with planning and for proper direction of the eighteen vessels under him.

"The Navy Department ordered boiler pressure of the *Wyoming, Arkansas, Florida* and *Utah* limited to 160 pounds, which entails a maximum speed of 14 knots with accompanying difficulties in the operation of auxiliary machinery. Boilers in bad shape. If a battleship is to last twenty years a program of reboilering and reconditioning should be placed in effect, analogous to replacement of guns. One is useless without the other. The sooner these ships are converted into oil burners and reboilered the better the fleet will be as a unit. The thirteen older battleships all need increasing the elevation of turret guns, thereby enabling all allowed us under the treaty to engage at approximately equally long ranges.

"Anti-aircraft batteries of the older ships are incomplete and this is the more serious because of the lack of aircraft carriers.

"Armored cruisers should be used for the midshipmen's practice cruise. Cruisers need to be built, of 10,000 tons, mounting 8-inch guns, as supports for the screen and as linking vessels. Maneuvers showed great deficiency.

"Submarine operations were the worst of all combatant ships taking part. Design obsolete. Ventilation poor and at times non-existent. Unreliable. Holland boats of less radius and have drag when heavily loaded. All submarines are so deficient in speed as to be of small use for fleet work except by accident of position. Considering poor material, the work of personnel aboard these submarines is in many cases most admirable and even heroic.

"Minelayers had no opportunity to demonstrate usefulness. Great shortage of mines for such an expedition and a non-existence of modern mines, which deficiencies must be rectified.

"Lack of sufficient minesweepers for maneuvers and need of putting several more in commission. Machinery not very reliable, but considering size they function well. Lack of minesweeping gear—these boats should hereafter be required to have same always on hand. Need for studying and developing mine sweeping at higher speeds.

"The one aircraft carrier (*Langley*) was supposed to carry fifty-eight planes and actually only had six, which, however, served good purpose, considering their number and capabilities and *Langley's* own characteristics. Atlantic air squadrons had twenty-seven seaplanes with Black forces, which were most useful while working from a base. Attempts to operate them from a carrier should be made. Catapults not working well on ships and therefore *Langley* was only ship to send up planes. Until it is demonstrated that planes will operate at sea from the battleships and cruisers on which they are now carried it would be premature to alter or rearrange any other types of combatant ships for their accommodation.

"Arresting gear, deck lighting and the material requirements to permit night flying should be developed. Aircraft carriers should have separate radio receiving rooms to permit duplex operation, in order that planes in the air may be communicated with efficiency while radio work with other units is going on. The construction of the two carriers building should be expedited. In connection with their commissioning it should be borne

in mind that each will require the constant attendance of from three to six destroyers, which should be provided for this purpose.

"Destroyer tenders are deficient in speed. Need reconditioning and early completion of more capable ships to replace them.

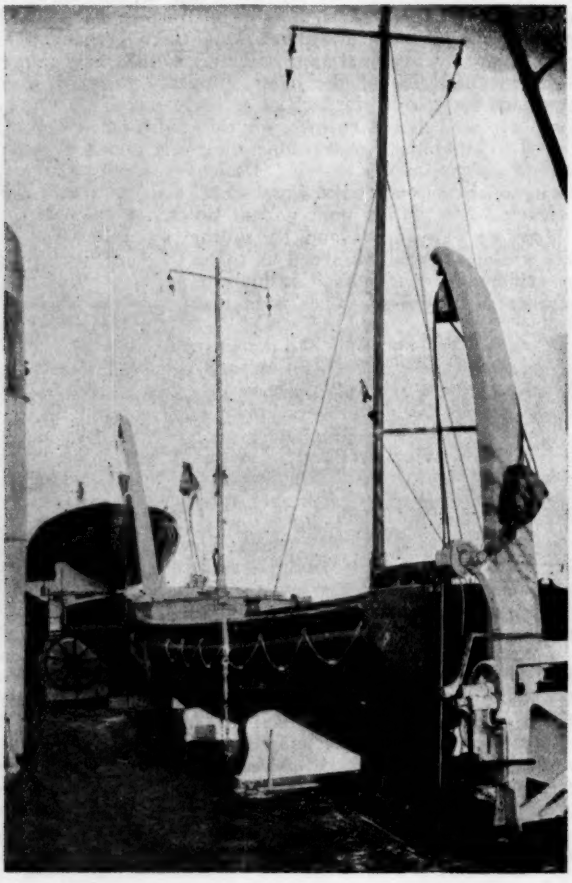
Submarine tenders are slow and unreliable in mobility, not adequate in capacity and early completion of new ones is hoped for. Absence of anti-aircraft guns in submarine tenders.

"Auxiliary types lack speed. The Train under convoy would limit speed to 7½ knots. Their towing gear should at all times be kept ready for use at short notice in making a fleet passage.

"Radio equipment inadequate for lack of separate receiving rooms on flagships, aircraft carriers, etc., ships which must perform duplex works; instruments need improving also.

"None of the following types of ships arrived at Culebra with the fleet: Light cruisers, store ships, tugs, seaplanes, miscellaneous auxiliaries, destroyer tenders, colliers, repair ships, lighter-than-air craft."

NAVIGATION AND RADIO



Last Word in Lifeboats

The Nautical Gazette, 3 May, 1924.—The new liner *Columbus* of the North German Lloyd, which arrived at New York on her maiden voyage this week, is equipped with a new type of motor-propelled lifeboat fitted with wireless apparatus. These boats contain complete sending and receiving instruments, current being supplied by a small generator operated by the boat's motor. These radio stations are ready for service immediately upon the launching of the boat, thereby enabling the boats to keep together. The motors in the boats are powerful enough to enable the boat to tow a long line of other life-saving craft, thus reducing the risk of loss of life by the sinking of the ship. The above photograph shows one of the motor lifeboats with its wireless equipment on the *Columbus*.

MISCELLANEOUS

Japanese Comment on World Problems

By Hector C. Bywater, Baltimore *Sun*, 18 May, 1924.—London, April 23.—Britain's new cruisers, the Bonin Islands and American anti-Japonism monopolize the latest budget of press clippings to reach me from Tokio. Taking these subjects in their proper order, it is very diverting to find Japan, of all nations, critical of the British Government's decision to lay down five ships of the cruising class.

The Tokio *Nichi Nichi* chides the MacDonald Cabinet for its supposed truckling to Admiralty officials. It reminds the British Labor Premier that "the general belief among the Japanese people was that a Labor Government would display considerable courage in acting up to its declared principles. It was thought that it would take resolute steps at least for the reduction of naval armaments in obedience to the spirit of the Washington Naval Treaty. Has it satisfied this expectation, however? Far from it. While leaving the Singapore scheme in a state of suspense, it has taken in hand the construction of five cruisers on the ground of the relief of unemployment."

The *Nichi Nichi* then waxes eloquent on the inconsistency, not to say the hyprocrisy, of the Labor Government in embarking on a scheme "such as is sure to excite uneasiness and misunderstanding in the minds of other powers." When all the signatory powers of the naval treaty are in duty bound to abstain from all measures suggestive of naval expansion, the Tokio journal is shocked to think that the MacDonald Cabinet is fathering a plan which is provocative of naval rivalry. "When the biggest naval power of the world is in this mood, it is hopeless to look for world co-operation in the cause of naval reduction." One is forced to conclude either that the *Nichi Nichi* has an overdeveloped sense of humor or that it is painfully ignorant of the elementary facts of the subject it is discussing.

The one power above all others which has flouted the spirit of the Washington treaty in the matter of naval construction is Japan. The evidence in support of that statement is overwhelming. It can best be epitomized in a few figures, as follows:

Warships laid down and authorized since the Washington treaty.

	Great Britain	*Japan*
Cruisers	6	12
Destroyers	2	36
Submarines	1	40

Comment on the above would be superfluous!

Turning to the Bonin Islands, Mr. Kawakami's categorical statement in *The Sun* that no fortifications of any description had been completed,

or even undertaken, in that territory prior to the conference appears to have been widely reproduced in the Japanese home press. Apropos of which, a correspondent forwards me a cutting from the *Japan Chronicle* of June 14, 1923, of which the following is an extract:

"The fortifications on the Bonin Islands were among those which, under the Washington treaty, are, like the fortifications of Hongkong, Formosa, the Pescadores and the Phillipines, to remain *in statu quo*. There was a pretty fierce discussion on this point, as it was argued that the Bonins were an essential part of Japan and not merely 'an insular possession.' . . . But when the *Saturday Review* states that it is not generally known that Japan had fortified the islands, it only has itself to blame for the general ignorance. The information that fortifications on a large scale were being constructed was published in the *Japan Chronicle;* it was semi-officially denied; the statement was reiterated. Of course, the denial was only camouflage and the fortifications were rushed on and, it is understood, completed, making the Bonins a very strong position."

The *Japan Chronicle* and several of the Japanese vernacular journals stated in 1921, not once but repeatedly, that the development of the Bonins as a fortified naval base was at that time actively proceeding, and in November or December of the same year they announced the holding of festivities on the main island of the group to celebrate the completion of the work.

Considering the rigorous censorship on military news in Japan, it is unbelievable that newspapers there should have been allowed to publish intelligence which, if untrue, was calculated gravely to prejudice the Japanese case at Washington; or that, if they did publish it in despite of the censorship, they would have escaped severe penalties. Yet here we find the *Japan Chronicle* of last June reaffirming the statement it had made two years beforehand with regard to the fortification of the Bonins.

In these circumstances, it would surprise me to find any student of Pacific strategy treating the Bonin Islands as other than a strongly fortified Japanese naval base. As such, we may be sure, it figures in the "war games" of all the naval staff colleges.

Writing before the latest immigration dispute, the Osaka *Asahi*, a very widely circulated organ, insisted that nothing annoys the Japanese more than the racial prejudice displayed against them in the United States. Brushing aside all the economic, political and social arguments which are advanced by Americans in support of exclusionist laws, it maintains that the root cause is racial antipathy.

The plea that Japanese immigrants not only disturb the American labor market but tend to lower the standard of living is dismissed as an unworthy quibble. "When the Japanese immigrants heard this complaint they set themselves in earnest to elevate their standard of living, and a marked improvement in this respect was soon noticed." Whereupon American critics changed their tactics, abandoned the standard-of-living argument, and attacked the Japanese settlers on the ground of their alleged increasing control of the economic resources of the Western States. When this fear also was shown to be baseless, Japan and her people were forthwith charged with militaristic tendencies, the Twenty-one Demands on China being cited as proof positive thereof. The charge of militarism, contends the *Asahi*, was refuted by Japan's conduct at the Washington arms parley.

It believes, however, that every attempt to justify Japan in the eyes of the American people is wasted endeavor. "Since sentiment is the dominant factor in the anti-Japanese campaign, no amount of argument will avail to defeat it." As soon as one argument is disproved another is advanced. In short, anti-Japonism will persist until the stubborn racial antipathy, which finds vent in insults heaped on the Japanese and in efforts to sweep every

immigrant out of the United States is eliminated from American minds. Meanwhile, banquets and social ceremonies as a means of promoting friendship between the two nations are quite futile, the *Asahi* thinks. It concludes with a warning as to the possible effects of this ex-acerbation of feeling on both sides, "which may easily lead to a dreadful catastrophe."

It is curious to note how carefully Japanese papers ignore the fact that the racial discrimination on America's part which so excites their wrath is practiced by their own country to an equal if not to a greater degree. Judging from her procedure toward them, Japan holds the Chinese in more contempt than the most ardent exclusionist in California holds the Japanese. Chinese are admitted into Japan only under the most rigorous conditions. They labor under all manner of disabilities; they cannot become Japanese citizens nor are they allowed to acquire land.

Large numbers of Chinese resident in Japan were deported after the earthquake on the pretext of their being undesirable aliens. Even the Koreans, although Japanese subjects, are not permitted to enter Japan save in special circumstances, and when there they are liable to suffer savage persecution.

Nor should it be forgotten that California, in denying Japanese the right to own land, has merely taken a leaf from Japan's statute book, since no foreigner, whatever his nationality, is eligible as a land owner in Japan. Actually, therefore, Japan claims for her subjects in the United States a privilege which she has never conceded to American citizens within her own borders.

"Tit for tat" as a national policy may be open to criticism on ethical grounds, but such criticism comes with a bad grace from those who have themselves consistently pursued that very policy. Japan has really no title to come forward as the champion of racial equality.

In my book, *Sea Power in the Pacific*, I gave many instances of her studied and even harsh discrimination against the alien within her gates. We see a further example of this same one-sided way of looking at things in the protest of Japanese papers against the building of British cruisers at a time when their own country is leading the whole world in naval construction. East is east and west is west, but the mental gulf between them must be wide indeed if Japanese comment on the immigration and naval issues faithfully reflects the working of the Japanese mind.

New Arms Conference Not Sure to Succeed

By H. Wilson Harris, Baltimore *Sun*, 7 May.—London, April 24.—Europe, and Great Britain in particular, has taken a good deal of notice of Mr. Coolidge's recent speech on the possibility of another Washington Conference to try to push disarmament further in the sphere of air, land and submarine warfare.

It is quite true that we do not know how much the President means. We are doubtful how far his words represent merely a gesture popular, and perhaps profitable, in the year of the presidential election. We recognize that talk of a conference after the reparation question is settled means talk of a conference that must be still some way off.

None the less the President's words have been read with the keenest interest on this side. The newspapers featured them. People one meets are talking about them. The prospect of help from anywhere in the attempt to solve the problem of armaments is welcome, and help from a country with which we are anxious to maintain close co-operation is doubly welcome.

But with all that the note of caution is being persistently sounded. It is easy to talk of a conference for the reduction of armaments, particularly with the Washington Conference of 1921-1922 to point to as precedent.

It might be even easy—perhaps rather too easy—to get a conference actually summoned for the purpose. And though that step, if it is ever taken, will not be taken yet, Mr. Coolidge's speech has sufficiently turned men's thoughts in different continents toward the armament problem to make it desirable to examine the arms conference suggestion as it presents itself to a far from negligible section of political thinkers in Great Britain.

It ought, by the way, to be remarked that Mr. Coolidge is not the only statesman turning over this idea in his mind. Mr. Ramsay MacDonald is credited with precisely the same thought, and though he has not advanced quite as far as the President the two men's minds have clearly been working on parallel lines.

Have they been working on practical lines? Is there, in other words, good reason to believe that an endeavor to repeat the experiment—for experiment it indisputably was—of the Washington Conference in a far more complicated and difficult field would be successful? It is very necessary to face that question frankly and answer it candidly. There must be no risk of a fruitless conference. That would do more harm than good for a palpable failure might postpone a new attempt for a generation.

That, it may be pointed out, is one of the inevitable defects of the conference method. A conference is an isolated institution. The delegates meet, negotiate for perhaps a month or two months, and then must of necessity disperse, whether they have achieved results or not. They cannot afford to go slowly. There is no permanent organization through which the edifice it is sought to raise can be patiently built up stone by stone. The endeavors of a conference are almost invariably endeavors with a time limit.

But, it may be rejoined, the Washington Conference undeniably succeeded. Most happily it did. But excessive hopes must not be based even on the Washington Conference. To begin with, the powers concerned were in reality only three, for everything was subordinate to an agreement between America, Britain and Japan. In the second place, the issue involved—the limitation of vessels of one particular class, and a class on whose intrinsic value opinions differed widely—was relatively narrow. In the third place, America carried the conference more than fifty per cent of the way to success by the dramatic offer voiced by Mr. Hughes on November 12 to scrap American ships without remorse if the other nations would follow America's example. In the fourth place, the conference failed signally to reach any agreement on submarines or on aircraft or on vessels under 10,000 tons, or indeed on any type except the capital ship.

It is worth while examining in the light of those facts the prospects of a new conference to secure agreements for the limitation of armaments on a far wider scale. In the first place, it would be necessary to achieve an accord not between three nations but between fifty or sixty. In the second, it would be necessary to get the fifty or sixty to agree on questions, such as the limitation of aircraft, which the three—or rather the five, for France and Italy were concerned with this—declared for the present to be insoluble.

In the third, the United States, in taking the initiative in the calling of such a conference, is in no position, as she was in the case of the naval conference, to give the lead by a great act of renunciation. In the matter of land forces America, to her credit, has nothing to renounce. France is the kind of nation that could launch a disarmament proposal where land forces are concerned, and there is singularly small sign of that happening.

Moreover, the standard of measurement of capital ships is simple. It is a mere question of tonnage and speed and gun power. But you cannot measure an army satisfactorily either by the number of men in it or by the money spent on it, or by any other reliable criterion. Its strength is what it proves itself to be in action.

But there is one dominating fact more fundamental than any yet mentioned. Nations—at all events, European nations—will not in the present state of the world reduce their armies, and so diminish the protection they believe armies to confer, unless some other form of protection can be guaranteed them instead.

That other form must almost necessarily be a collective guarantee of mutual defense, and that is precisely the guarantee the United States, if we on this side have any accurate understanding of its political convictions, is willing to give. It was offered in 1919 and then withdrawn when there was queston of guaranteeing the safety of only a single nation—France. France has not forgotten that; she has repeatedly made it clear that for her at least considerations of security must come before any desire for disarmament.

These may not be welcome facts, but they are facts none the less, and facts impressed with special emphasis on all who have for the last two or three years been working at the problem of disarmament in Europe. Over here the problem presents itself in a fatally simple form. The declaration "No disarmament without security" expresses it with hopeless accuracy.

It is because that declaration seemed decisive that the principles embodied in the draft Treaty of Mutual Assistance—wherein disarmament and security are interlocked—were worked out. After all, even at Washington the path toward disarmament had to be smoothed by the conclusion of something very like a moral guarantee pact regarding the Pacific Ocean.

There is, moreover, another factor not so far mentioned at all. At Washington the American delegation was adamant on one point: There must be no discussion of this nation's or that nation's naval needs. Once that started, all hope of agreed conclusions would vanish. The only possible course was to seize on the ratio exisitng between the different fleets on a particular day and agree to preserve that ratio unchanged, but with navies substantially diminished on a uniform scale.

You could do that with capital ships. To do it with land armies would be impossible. If for no other reason, it would be grossly unfair to those countries which (like America and Britain) have already cut their armies to the lowest level possible. Some wholly different criterion would have to be found and no one seems to have found it yet.

For those reasons, and others that might be further developed, any proposal for a new disarmament conference, while it must be received with the widest sympathy, must equally be subjected to the most searching examination. So far as the experience of Europe goes for anything, it is hard to believe that any conference summoned without months or years of preparation could conceivably succeed.

What most men here, indeed, are wondering is whether in the case of land armaments the frontal attack, as it may be termed, can succeed at all, or whether we must not rely almost wholly on so smoothing out international relations and providing just tribunals for the settlement of disputes, as gradually to turn men's minds from the thought of war altogether.

When that process has well begun a point may be reached at which definition and impetus can be given to it by an attempt to cut down armies on a specific scale. But as things are it is just those who care most about disarmament who feel most keenly the need of moving with the utmost circumspection.

Mediterranean Navies

Army, Navy and Air Force Gazette, 12 April.—The decision last week of the Finance Commission of the French Senate to approve of the new Naval Bill is another indication of the attention which the Mediterranean

Powers are giving to their naval needs. In Italy, as is well known, a strong lead in this direction has been given by Signor Mussolini, who takes the view that while the Italian position on land is sufficiently strong, this is not the case afloat. His proposal, therefore, is to increase gradually but continuously the strength and efficiency of the fleet, and he has declared his readiness to do everything in his power that the Navy may have all it needs in order to be prepared for any eventuality. So far as they have been disclosed, the plans to give effect to this policy are of exceptional interest. They involve the provision of new bases in Sardinia and Sicily—£200,000 being spent on Cagliari, in the former island—the buildng of two cruisers and four submarines immediately, and also of an aircraft-carrier and a motor-boat carrier. The last-named type, which carries us back some forty years to the days of the old torpedo depot-ships, will excite keen attention among naval officers and architects when its details are known. More important, in its way, is the encouragement given to the *personnel*, by the grant of bonuses both to officers and men in respect of their sea time and the like, a contract to the five and one-half per cent cut which is to be made in the wages of our own seas officers.

These measures constitute no new threat to anybody, but are dictated solely by the need for maintaining that balance of power which Italy deems to be essential for their security and her position in the world. With the removal of Austria from the leading Powers, the strategy of Italy is no longer based upon the Adriatic as the chief center of possible danger, and her readjustment of bases therefore compares with the British proposal to develop Singapore. Whether or not Signor Mussolini's plans are to come within the purview of Mr. MacDonald's efforts to reduce naval armaments by international consent remains to be seen. Meantime, it is to be noted that other Mediterranean Powers are looking to their defenses by sea. Spain has in hand two first-class light cruisers and a number of small craft, and even Turkey has sent to London a Naval Mission to study shipbuilding. If, therefore, France is to retain her old position as the leading Mediterranean Power, the bill now before the Senate is the least she can accept. It provides for two new cruisers of 10,000 tons, six destroyers, and two submarines. In the classes, which are likely to count in a future conflict, it is a question whether Italy, by her preponderance in light cruisers and destroyers, has not already overhauled France. For Great Britain, the matter is one of direct importance, for the Mediterranean is, of course, one of the chief highways of our shipping.

NAVAL OIL RESERVES

The following correspondence is taken from the hearings before the Committee on Public Lands and Surveys of the U. S. Senate:

UNITED STATES NAVAL ACADEMY,
ENGINEERING EXPERIMENT STATION,
Annapolis, Md., December 9, 1922.

From: Capt. John Halligan, Jr., U. S. Navy.
To: Secretary of the Navy, via Superintendent United States Naval Academy and Bureau of Engineering.
Subject: Naval petroleum reserves.

1. Having had, prior to 1917, somewhat intimate contact with the problem of the future supply of petroleum for the Navy, I have followed with interest recent developments affecting this problem and have reached certain conclusions which I believe it my duty to present through proper channels to the Navy Department.

2. These are:

(1) As far as we can now see into the future petroleum will be the preferred source of fuel for all naval vessels, including aircraft, and for

certain industries important to national defense. It will be practically the sole source of lubricants. Hence no nation can aspire to sea power without an assured dependable supply of petroleum.

(2) This Nation has a position of advantage in that it alone of the nations aspiring to sea power possesses within its borders an adequate supply of petroleum. This advantage should be jealously guarded because in a prolonged war it may be the deciding factor. With limitation of naval armaments the relative importance of this advantage is increased.

(3) Other nations are forced to develop artificial reserves of petroleum to be stored in tanks. Storage capacity in tanks greater than that required for current needs is desirable to us to permit purchases in large amounts in a low market. But such storage as a means of providing a reserve for the remote future is expensive and insecure as compared with the system of natural reserves, and, in the case of our country, is unnecessary. Tanks may be destroyed by lightning, fire, or by the acts of an enemy.

(4) The best available estimate of the amount of petroleum remaining underground in the United States is that it is about twenty times our present annual production. In consequence this Nation will require petroleum from abroad in rapidly increasing proportion to domestic production. Costs will accordingly increase. In time of war we can not depend upon foreign sources of supply unless we have command of the sea.

(5) The naval petroleum reserves were established and until now have been maintained for the purpose of providing an emergency reserve for use when commercial sources of supply shall have failed. There are in naval petroleum reserves No. 1 and No. 3 extensive deposits of petroleum that can be maintained with reasonable immunity from drainage, provided effort be made by the departments of the Government to this end.

The petroleum in reserve No. 3 is particularly valuable for aviation because of its high gasoline content. Unless existing leases to these properties are canceled or modified, the oil now in these reserves will be exhausted by the time other domestic sources of supply have failed.

(6) This oil is of greater value to the Nation than to private interests. Regardless of its value in terms of national security, to exploit these reserves in the present flooded market is economically unsound. The value of the petroleum in the three naval reserves is hundreds of millions of dollars. It is comparable to the cost of the Panama Canal. Its prospective value to the Nation can not be measured in dollars.

(7) The hitherto existent policy with respect to these reserves has been to hold in the ground against future national necessity as much of this oil as can be so held; to exploit by lease only to such extent as is indicated by the definite probability of loss by drainage. The values involved attach to this problem an importance that justifies an exhaustive study on the part of the Navy before a change of this policy is consummated.

3. I therefore earnestly recommend that the General Board be directed to formulate a policy for the guidance of the Navy Department on the utilization of the naval fuel reserves.

JOHN HALLIGAN, JR.

UNITED STATES NAVAL ACADEMY,
ENGINEERING EXPERIMENT STATION,
Annapolis, Md., January 23, 1923.

From: Capt. John Halligan, Jr., United States Navy.
To: Secretary of the Navy, via Bureau of Engineering, via Superintendent, United States Naval Academy.

Subject: Naval petroleum reserves.
Reference: (*a*) Letter on same subject of December 9, 1922. (*b*) Department letter Op. 24—Ha 13668—1050 of December 27, 1922.

1. Reference (*a*) argued that the importance of the naval petroleum reserves to the Nation justifies an exhaustive study on the part of the Navy before a change of policy from conservation to exploitation is consummated, and recommended that the General Board make such a study to include all naval fuel reserves.

2. Reference (*b*) states: "The department's policy on the utilization of the naval petroleum reserves is defensive. The reasons for adopting it are given fully in inclosure (A)." Inclosure (A) is Senate Document 210, "Naval reserve oil leases."

3. A sense of loyalty to the Navy impels me to continue this correspondence at the risk of appearing to intrude in a matter upon which the department has taken a definite stand. I believe that a mistake of serious consequence to the interests of the Navy has been made, and that it is my duty to endeavor to persuade the department to a realization of this mistake in order that the consequences may be minimized.

4. The naval petroleum reserves were constituted "for the exclusive use or benefit of the Navy" as a means of providing a source of fuel and lubricants after other domestic sources of supply have failed.

5. Because of the value of the petroleum in these reserves (hundreds of millions of dollars), there has from the beginning been a continuous effort by private interests to exploit these properties at the expense of the Navy. In 1916 such an attempt, in the form of a leasing bill, nearly succeeded. At that time an extensive investigation of the future supply of petroleum was made by a board of naval officers and by a committee of the naval consulting board, which had the advice of civilians expert in the various phases of the petroleum problem.

5. Both the naval board and the naval consulting board emphatically recorded the value of these reserves and the necessity for protecting them against diversion to private interests.

6. The following is from the Report of the Naval Fuel Oil Board, dated December 22, 1916:

"The most serious phase of the fuel-oil situation is the insecurity of the Nation's tenure of duly constituted petroleum reserves. * * * In the four years that have passed since the creation of the first naval petroleum reserves there has been a continuous attack on the Navy's tenure of these lands by private interests and corporations. The strength of this attack is sufficient to threaten a change of existing law in order to wrest control of these lands from the Navy. Legislation now pending intends to destroy the Navy's title to the bulk of its oil in the naval reserves. Action of the Congress in this matter will indicate whether it is possible to retain these or similar reserves after they have become commercially attractive. It will determine whether in such a contest between private interests and those of the Government the latter can survive."

7. The Naval Consulting Board, which then was the official civilian advisory board of the Navy, composed of members of 11 national engineering and scientific societies, resolved "* * * that any legislation which may divert from the Navy and portions of its reserves will seriously weaken the Navy and imperil the national defense. The Naval Consulting Board, therefore, urges upon the Nation and its Representatives in Congress to permit no steps to be taken that will impair the integrity of the existing naval petroleum reserves."

8. As a member of the naval board, I was familiar with the problem at that time. Recently I have made some study of its present phases. I am convinced that the differences between conditions affecting the policy

as to the maintenance of these reserves then and now emphasize the necessity of conservation of all the petroleum that can be held by the Navy.

9. The outstanding features of the petroleum situation from a naval viewpoint are:

This country is now facing the definite probability of the depletion of its petroleum reserves to such extent that in this generation it will depend on foreign sources of supply for the greater part of its consumption.

The British Government has for years pursued a policy designed to give that Government control of the world's supply of petroleum, and now apparently has achieved such control. Petroleum is the dominant note in British diplomacy. That Government is in the oil business, and controls companies whose investments are said to double the combined capitalization of all American oil companies. The Royal Dutch Shell Co., the majority of whose stock is owned by the British Government, in 1919 took 47 per cent of its total production out of the United States. In 10 years this country will depend on the British Government for a large portion of its petroleum supply.

This likelihood of dependence on a foreign government for our fuel supply has so important a bearing on the subject of this paper that, for purposes of emphasis, certain pertinent statements of competent authority are now given:

United States Geological Survey: "Foreign countries have reserves to last 250 years; this country 18 years. We are using our oil supply 14 times as fast as the rest of the world."

Captain Foley, United States Shipping Board: "The real problem is where to get the oil as requirements increase with the years. The United States produces 65 per cent of all the oil in the world, and we permit equal rights in development to all the world. But the visible future oil production—from 90 to 97 per cent is under the control of Great Britain. British fields are open only to British nationals."

Dr. George Otis Smith, Director United States Geological Survey: "The fuel reserves of a nation are no less essential to its future industrial welfare than the gold reserves are essential to its present financial stability, but once lowered these reserves of coal and oil in the ground can never be replenished.

"The requirements of the American Navy and the new merchant marine present a priority demand of the first order. The Navy needs 8,000,000 barrels of fuel oil a year; the Shipping Board 60,000,000 barrels for 1921.

"Surely no American with vision wishes to contemplate even the possibility of a shortage of fuel oil that would endanger the immediate availability of these battleships, cruisers, and destroyers or interfere with the successful operation of the passenger and freight steamers, in the construction of which our Nation has invested so many millions."

J. O. Lewis, chief petroleum technicist Bureau of Mines: "Our foremost authorities warn us of entirely inadequate domestic reserves."

W. G. Harding (President elect): "It is the testimony alike of geologists and of the technical oil authorities that such a rate of consumption can not long continue without vast and increasing importations of oil.

"While our Government has been attempting to organize a model state of society other great States have been looking about to dominate the petroleum production of the world, because of their conviction that in the control of petroleum they might find the power to control the commerce, the trade, the industry of the twentieth-century world.

"An eminent British authority recently declared that the British Empire now controls more than 90 per cent of the world's known supplies. He

ventured to boast that the petroleum future of the world was now securely in the hands of the British people."

W. C. Teagle, president Standard Oil of New Jersey: "The United States is now spending its petroleum wealth for the world's benefit in order to meet 70 per cent of the world's present demand. Americans have done this primarily because they had the most accessible oil and the facilities for refining and distributing it. Is it reasonable, however, to ask that they go heedlessly on to the quick exhaustion of their supply and then retire from the oil business?"

Admiral Benson, chairman Shipping Board: "May I impress upon you with all the earnestness at my command that we are now facing the most unrelenting and stifling competition of nations trained in all the fine points of ship operations? One of our greatest advantages lies in the fact that about 75 per cent of our entire fleet burns oil for fuel, as compared with about 15 per cent for all foreign shipping. This advantage can not be realized to the fullest extent unless the Shipping Board and the American merchant marine as a whole can be assured of an adequate supply of fuel oil not only now, but, of more importance, in the future as well, at reasonable prices."

R. L. Welch, secretary, American Petroleum Institute: "There are many reasons * * * which suggest the probability of an unprecedented shortage of oil in the next few years, due to the falling off in the production in the known fields of the world."

James E. O'Neill, president of the Prairie Oil Co.: "After careful study of the situation, I am convinced that within 10 years or less the refiners of the Nation will be forced to secure 50 per cent of their raw products from outside this country."

Prof. John Bownocker, State geologist for Ohio, believes that production of petroleum for the next 16 years will show a rapid decline each year, at which time our reserves will be well depleted. Mexico will cease to be an important factor in the next 3 years.

General Manager Kocter of the General Oil Co., who is also managing director of several other Dutch oil enterprises, in an interview in the *Financial Times* of London said: "In the United States within the next two years there will be crude-oil shortage and prices of crude oil and oil products and value of yet unmined petroleum must necessarily feel effects of such unavoidable shortage, and one result can only be higher prices and a large premium for oil reserves. So British and Dutch oil enterprises that have succeeded in securing control of a large part of the world's petroleum reserves can face the future with every confidence."

Oildom: "Early in this administration consideration was given by the Department of Commerce jointly with the Department of the Interior to the serious situation confronting our country in its supply of oil. As a result of a survey of our own and the world situation, it was concluded that our domestic sources of oil would at the present rate of exhaustion last only a generation, and that foreign nations were rapidly preempting the available oil-bearing territory."

Sir Mackay Edgar, head of Spaling & Co.: "Within 10 years United States will import oil to the extent of $1,000,000,000 annually, most of which will be paid to British.

"While America is exhausting her supplies at a prodigal rate, we are getting a firmer grip upon the world's oil resources. For 60 years America has run through a legacy of petroleum, which, if properly conserved, would have lasted her a century and a half, but carelessness and a gambling spirit have wrought an incalculable and irretrievable loss to the American industry * * *

"We hold in our hands the secure control of the future of the world's oil supply."

Walter H. Long, first lord of the British Admiralty: "If we secure the supplies of oil now available in the world, we can do what we like."

A. C. Bedford (chairman board of directors Standard Oil Co. of New Jersey): "England has been actively bent on getting a mortgage upon much of the potential oil production, not only outside of the United States but actually within a few miles of this very hall (San Francisco). So securely entrenched do they feel now that they have taken to commiserating us on the distress we are shortly going to feel when we cease to be the preeminent petroleum nation and begin paying tribute to their foresight.

"Sir Mackay Edgar boldly asserts that Great Britain already has control of the chief petroleum resources of the world outside of the United States. All the known oil fields, all the likely or probable oil fields outside of this country are in British hands or controlled by British capital, he tells us.

"We are at last sensing what the British recognized long ago, that the country that controls the petroleum supply is the country which will control world trade.

"We have drawn lavishly upon our forests, our coal, and our petroleum. * * * It is none too soon to adopt a comprehensive program for the safeguarding of our oil requirements 10 years hence."

David White, chief geologist, Geological Survey: "Great Britain has absorbed control of practically all the potentially rich oil fields of the world, principally in Persia, Mesopotamia, Ecuador, India, etc."

Senator McKellar in speech before the Senate: "Great Britain has under her exclusive control, besides her holdings in this country, the entire oil supply of Canada, Egypt, Persia, Mesopotamia, India, the East Indies, and a large section of the Mexican supply; experts estimate her resources at no less than 11,325,000,000 barrels. In addition to these holdings she owns a large share of the oil resources of this country, of Germany, Russia, China and East India. * * * The British oil producers discriminate against us in the boldest ways. They sell oil produced in Persia and elsewhere to us at $7 to $12 a barrel, or more than four times the price charged in the United States to British shippers."

Senator Phelan: "Here is a concrete case of what is happening. British interests are buying oil properties in California, without hindrance, and own now perhaps 30 per cent of the State's resources. The Dutch Shell Co. sold recently more than 100,000 barrels to Japan, and in Japanese tankers it was shipped from San Francisco to Japan. The price of that oil was $1.86 per barrel, and at the same time local consumers were charged $2.35. The local agent confidentially admitted the wrong to local interests but said he took his orders from London."

Senator Lodge: "From the best information obtainable the actual investment in money and other property of British nationally owned oil companies are practically double the amount the capitalization of all American oil companies in the United States and elsewhere."

Oildom: "There is absolutely no mistaking the fact that foreign interests are seeking to control every potential petroleum source in the world. * * * This work is being done not with the thought of to-day in mind but with plans laid and matured looking to a distant future. The motive behind this * * * is the knowledge that the nation in possession of an assured supply of crude petroleum will be the nation to succeed to maritime supremacy."

Secretary Fall: "Within the last two years, however, taught by the lessons of the war, Great Britain has deliberately pursued a policy of obtaining governmental control of all the great oil companies in which British subjects had been interested, and, going beyond this, has secured practical, if not sole, control of the great Royal-Dutch-Shell, and other foreign companies, particularly through what is known as the 'Royal Dutch Shell Group Combine,' which was effected in January, 1907.

"You will at once note the extensive holdings of this British national enterprise in the States of Oklahoma and California."

Ralph Arnold: "The proven Mexican oil reserve is absolutely at the mercy of its exploiters and may all be exhausted in a few months or at most in one or two years at the promised rate of development. Whether it is one and a half or two years or even a little longer or a little less before the break comes, it is certain to come."

Harry F. Sinclair: "But the chief point we should bear in mind is this: That if we should neglect to fortify ourselves with adequate reserves against future needs we would eventually pay far higher prices than if we had taken the necessary steps to assure to this country a lasting supply. Preparedness of any sort costs money. But we must pay the price sooner or later."

Oildom: "The superlative folly of the course we are now pursuing in producing more oil than there is demand for * * * it requires no apology for resorting to superlatives in characterizing the present madness of the operators as the compounding of folly." (Editorial.)

California Oil World editorial: "California oil should not be squandered by too hard rushing of development. Just at present, as we have pointed out again and again, there is a big overproduction for the market now available and production should be held down. * * * There is beginning a world hunger for oil that will surely grow."

Joint Committee American Association of Petroleum Geologists and United States Geological Survey estimate United States oil reserves to be 9,150,000,000 barrels on January 1, 1922. Of this 5,000,000,000 barrels is in sight, the remainder prospective and possible. There is 20 years' supply underground.

10. The Japanese Government has adopted a policy similar to that of Great Britain in order to guarantee a supply of petroleum for its navy and merchant marine. In Japan five oil fields, for the use of the navy, are held by the navy department. The Japanese Navy is constructing tankage to be filled with oil from America and Borneo.

11. Thus the two nations which we of the Navy must consider to be our rivals in naval strength have adopted strong governmental policies for the purposes of safeguarding the future supply of petroleum for their navies. In striking contrast, our Government, with the exhaustion of its petroleum in sight, and in a period of overproduction, is permitting the unnecessary exploiting of naval reserves that contain petroleum in sufficient quantity to safeguard our future. We are voluntarily passing from a position of advantage in this respect to one of inferiority. We are accepting a handicap in naval competition of similar dimensions to that given by the limitation of naval armaments, whereby we agreed to scrap uncompleted battleships on which a third of a billion dollars had been spent.

12. Until May 31, 1921, the naval petroleum reserves were administered by the Navy Department, with such assistance as was required from the Departments of the Interior and of Justice. A naval officer in California and an officer of the Navy Department maintained offices in which information was assembled and the efforts of the various officials of the Government having to do with the reserves were coordinated. These naval officers, by association with geologists, petroleum technicists, and practical oil men, were well qualified to advise the department in the administration of the reserve.

13. From the viewpoint of the Navy the situation was satisfactory. The three reserves had a petroleum content of perhaps 400,000,000 barrels, and the Navy's title to these properties seemed secure. It was recognized that there was danger of loss by drainage to a considerable extent in No. 2

reserve and to a slight extent in No. 1 and No. 3 reserves. In the case of No. 3 reserve this danger was not immediate, and could probably have been prevented by control of leasing privileges on Government land outside the reserve. Teapot Dome and the greater part of No. 1 reserve, with a combined content greater than 200,000,000 barrels, were regarded as secure against danger. This gave a reserve for the future, which, according to the estimate of the Fuel Oil Board of 1916, would provide for five years of war-time consumption.

14. After a careful study of Senate Document 210, and of other information available, I still believe that the foregoing estimate of the general situation was sound.

15. For protection against unavoidable drainage leases were made for offset drilling. This method promised a gradual exploitation of parts of the reserves, the proceeds from which would reduce the cost of fuel to the Navy in time of peace. This is an important consideration because of the probability of a great increase in the cost of petroleum within the next decade.

16. The naval shale reserves which has been established on recommendation of the fuel oil board were regarded as a valuable provision for the remote future when petroleum from underground will not be available.

17. Such were the conditions when the reserves were turned over to the Department of the Interior for "conservation, development, and operation." It was predicted by the naval officer then on duty in the Navy Department in connection with the reserves that this would mean "the beginning of the end of the naval reserves."

18. Within a year naval petroleum reserve No. 3 had been leased in its entirety, leasing privileges to all companies in naval reserve No. 2 had been extended to provide for the gradual drilling of these properties to the extent of 1 well to 10 acres, and leases had been given in No. 1 reserve which, I believe, now include the greater part, if not all, of that reserve.

19. The Navy benefits from these leases to the extent of a portion of the oil removed. This may be in oil, which will come to us when there are other adequate domestic sources of supply, or to a certain extent in tank construction. Provision is made for cash royalties, but my understanding is that this will not come to the Navy. The urgent military necessity for additional tankage is admitted, but it is suggested that these tanks might be constructed at less cost to the Nation than at the expense of our petroleum reserves.

20. In the short time that these properties have been administered by the Department of the Interior there has been effected a radical change of policy from conservation to exploitation under conditions which prevented the presentation of arguments against such a change of policy. These arguments, I believe, would have been conclusive.

21. What has happened to these reserves argues the necessity of returning to the Navy Department the control of the naval fuel reserves (which include the shale reserves). Unless this is done, I feel that the shale reserves will have a similar fate as soon as they have become commercially attractive.

22. I don't know what can now be done to conserve the oil still remaining in the three reserves. I believe that the Department should direct its efforts vigorously in that direction, and the following procedure is suggested:

(1) Obtain a statement from the United States Geological Survey as to what portions of the naval petroleum reserves can be held with reasonable immunity from drainage.

(2) Cap the wells that have been drilled in these areas.
(3) Modify or cancel existing leases as necessary.
(4) Return control of the naval fuel reserves to the Navy.
(5) Have the General Board of the Navy formulate a policy for the guidance of the Navy Department on "the utilization of the naval fuel reserves."

JOHN HALLIGAN, JR.

U. S. S. "DETROIT,"
Solomons, Md., September 7, 1923.

From: Capt. John Halligan, Jr., U. S. Navy.
To: Secretary of the Navy.
Subject: Naval petroleum reserves.
References: (*a*) Letter on same subject of December 9, 1922; (*b*) Department letter Op—24—1t—13668—1050 of December 27, 1922; (*c*) Letter on same subject of January 23, 1923; (*d*) Department letter Op—23x—EM—5—13668—1050: 1 of July 13, 1923; (*e*) Senate Document 210, Sixty-seventh Congress.

1. From reference (*d*) I note that the Navy Department still controls the naval petroleum reserves; that the reasons for the exploiting of these reserves are those given in Senate Document 210; that the Navy Department is content with the dispositions that have been made of the reserves; and that a new petroleum reserve in Alaska has been given the Navy.

2. My conclusions on this subject remain so divergent from those of the department and they are so well supported by other officers of the service who are familiar with the problem that it seems to me better to state frankly where the difference arises, and what the reasons are for it, than to allow them to remain buried. This I hope I may do without impropriety.

3. The naval petroleum reserves were the result of a well-considered plan to provide for our future naval security. The necessity for these reserves has been confirmed almost unanimously by those who have considered the problem—statesmen, civilian societies, geologists, and naval officers. The judgment of these men was well expressed by the late Theodore Roosevelt, who while Assistant Secretary of the Navy said that the preservation of the fuel-oil reserve is essential to the very life and future existence of the Navy. He pointed to the self-evident fact that the Government has a right to and must set aside oil lands, and prevent absolutely the taking of oil from these lands for private purposes.

4. Despite this national necessity it has been difficult for the Navy to hold these reserves. Since their beginning there has been a contest with the oil operators for their possession, in which we have had the splendid assistance of the Department of Justice and of the United States Geological Survey, but not always that of the Department of the Interior.

5. Due to the resistance of the Navy Department, aided by the Department of Justice and by certain societies who were inspired by patriotic motives, it appeared by the end of the last administration that the battle for the control of these reserves had been won and that the situation was well in hand.

6. The Executive order of May 31, 1921, by which "Responsibility for the protection and development of the reserves was transferred from the Navy Department to the Department of the Interior," placed the reserves in hands that had been reported to the Navy Department as not favorable to their conservation, and subsequent to this transfer of the reserves was a change in the method of handling them in the Navy Department, by which the officers who previously had handled the subject lost contact with the problem.

7. When, in the spring of 1922, it became known that the Teapot Dome

reserve had been secretly leased to the Sinclair interests; these officers and other naval officers who had had experience in the matter were shocked. Prompt public approval of the lease by high authority and the announcement of an investigation by a committee of the Senate operated to prevent protests that otherwise might have been made. The investigation by the Senate committee has not yet been held.

8. The arguments which seek to justify the leasing of the reserves as contained in Senate Document 210 and in the Navy Department letter, reference (*d*), are essentially as follows:

First. Of the 37,760 acres in Naval reserve No. 1, in California, the title to 6,760 acres had passed from the Navy, principally to the Southern Pacific Railroad and to the State of California.

Second. Under the previous naval administration serious losses to the Government had occurred due to delay in offset drilling in the California reserves.

Third. A condition of danger of loss by drainage rendered necessary the leasing of the Teapot Dome reserve.

Fourth. The lease of the Teapot Dome to the Sinclair interests was further justified by their agreement to build a pipe-line from the Wyoming fields which would give the Government a better price for its royalty oil from this and from the Salt Creek field.

Fifth. There was a serious condition of adverse claims affecting the Navy's title to the Teapot Dome reserve.

Sixth. As a result of the leasing of the reserves, a program of important oil tank construction has been effected.

9. Considering these points in sequence:

First. Effect of Southern Pacific holdings on the integrity of No. 1 reserve.

The officer who in the Navy Department had cognizance of matters pertaining to the reserves states:

"With respect to reserve No. 1, there has never been a time when an agreement could not have been made with the Southern Pacific regarding holding oil in the ground, either by a nondrilling compact or by an exchange of lands."

Second. Loss by drainage in the California reserves due to delay in offset drilling.

The previous naval administration of the reserves is criticized as having caused by "procrastination" in offset drilling a loss of $800,000 in royalties from section 1—31—24 of No. 1 reserve. This case is cited by the Navy Department in reference (*d*) as an argument for the lease of the reserves.

The Standard Oil Co. drilled nine wells near the northern boundary of this portion of the reserve between August, 1920, and September, 1921. Offset drilling to protect the Navy's oil did not begin until October, 1921, and in the meantime the loss is stated to have occurred.

A part of this delay and consequent loss was due, I believe, to the fact that after bids for offset wells had been opened and the contract awarded litigation ensued, as is described in the following extract from a memorandum to the Secretary of the Navy dated 18 May, 1921, written by the officer in the Navy Department who had cognizance of the reserves:

"The United Midway Oil Land Co. case is another example of how the Navy's interests will be protected. The Department of the Interior knows that this company has no rights to uphold their case, but on account of some so-called equity, which does not exist, the Navy Department is daily losing thousands of barrels of oil by drainage to the Standard Oil Co. Judge Finney has told me personally that this company has no rights to this land, and I have been informally advised that the Attorney General has

been requested by the Secretary of the Interior not to render an opinion in this case."

Third. Drainage from Teapot Dome.

The one condition that could have justified the exploiting of Teapot Dome was a definite probability of a serious loss of its oil content by drainage, and then only if this could not have been prevented by means available to the Government. Proper protection of the Navy's interest in this reserve required that this probability of serious loss be definitely established, and that preventive means available to this Government be considered. The importance of this reserve and its value justified the collating of all available information bearing on the subject.

This apparently was not done.

The lease was made so secretly that the naval officers who by experience were competent to advise the department, the officers who had been charged with the cognizance of matters pertaining to the reserves, and who would have advised strongly against the lease, did not know that such a lease was being considered.

The Teapot Dome was regarded by competent authority—the United States Geological Survey, naval officers of experience, and by oil operators—as a particularly valuable reserve because of its security against loss by drainage, and because of the quality of its petroleum content. This reserve included, besides the Teapot Dome, an extension of the Salt Creek field, the latter a Government-owned field immediately to the northward of Teapot Dome. In this extension of the Salt Creek field, which comprises a small part of the naval reserve, there is admittedly danger of loss by drainage to an unimportant extent, but it appears probable that even this slight loss could have been prevented, either by controlling leases in the Salt Creek field or by other means within the power of the Government, had the Government earnestly desired the conservation of this oil.

The argument of the Navy Department in reference (*d*) and of Mr. Fall in Senate Document 210 rests heavily on opinions as to the possible or probable drainage of the Teapot Dome by Mr. C. H. Wegemann, formerly of the United States Geological Survey; Mr. Heald, of the Geological Survey; Mr. F. B. Tough, formerly chief oil and gas supervisor of the Bureau of Mines; and Mr. A. W. Ambrose, chief petroleum technologist, Bureau of Mines.

The department letter gives Mr. Wegemann as "one of the prominent official geologists of the United States Geological Survey." At the time Mr. Wegemann made his report of September, 1921, which is cited by the Navy Department and by the Secretary of the Interior, I believe that he was not in the Government service, but that he was in the employ of an oil company. It will be noted that his statement as to loss by drainage applies only to the northern portion of the reserve in the vicinity or to the northward of the fold which separated Teapot Dome from the Salt Creek field.

Mr. Heald's statement, instead of being an argument for the leasing of Teapot Dome is a strong argument against it. He states that the portions of the reserve north of the fault will presumably but not certainly ultimately be drained by wells drilled outside of the reserve; that at the present rate of production a year or more must elapse before any part of the reserve is appreciably damaged, and recommends positively against any leasing south of the fault; that is, in Teapot Dome proper.

Mr. Tough's statement is that he considers it probable that oil and not water will be found in the saddle separating Teapot Dome from the Salt Creek field, and that on this basis a large area in the northern portion of the reserve will be subject to drainage by wells drained on leased lands along the northwestern boundary of the reserve.

The conclusion of Mr. Ambrose is that if oil is found in the saddle in the second Wall Creek sand there will result drainage of this sand in the next six or seven years to a point in section 28 (which is in the vicinity of the saddle), and if conditions are favorable the productivity of the sand will be affected even farther to the south.

It is difficult to find in the statement of these gentlemen any probability of an immediate and serious loss by drainage from Teapot Dome.

There is, on the other hand, strong evidence that the Teapot Dome at the time of the lease to the Sinclair Co. was a well-protected oil structure with reasonable immunity from danger of loss by drainage.

On this important geological question, although statements from certain geologists are cited, I have found no statement from the Director of the United States Geological Survey. The Teapot Dome had been selected by that office for the Navy, its value as a reserve depended upon a geological condition upon which that office was competent to pass, and I believe that had an opinion from that office had been sought it would definitely have recommended against the Sinclair lease.

There follow opinions of others on the subject of the drainage of Teapot Dome:

Commander J. O. Richardson, United States Navy, May 1, 1922:

"Absolutely no drilling should be permitted on the Teapot Dome."

Commander H. A. Stuart, United States Navy, May 18, 1921:

"It is undoubtedly true that portions of the naval reserve No. 2 should be developed at the present time, due to the fact that its value as a reserve has been practically destroyed. To a certain extent there should also be some drilling on reserve No. 1, but reserve No. 3 should not be touched. The Navy Department has had this question of handling the reserves under observation and study ever since their establishment and their status and their needs are pretty thoroughly understood."

December 5, 1922:

"Unless there has been a greater change in the views of the Geological Survey within the last few months the advice that the Teapot Dome oil would be lost by drainage did not come from that source. Only a small portion of the northern part of it could be thus affected and this could be scotched by drilling a few line wells."

January 12, 1923:

"When I left the bureau, Doctor Mendenhall was in thorough agreement with me as to the desirability and the feasibility of maintaining practically all of No. 1 reserve intact. I know also that he had given no thought to the possibility even, not to mention the liability, of reserve No. 3 being exploited. He knew that the saddle in the northern portion of the Teapot Dome was supposed to be somewhat to the southward of the location where it was originally placed. I talked quite freely and frankly to him and he never intimated that any drilling was necessary for protection.

"It should be remembered that there was no actual drainage from the Teapot Dome when the lease was made and there was no occasion for the haste and secrecy with which the affair was conducted."

Lieut. Commander I. F. Landis, United States Navy, October 25, 1922:

"A large portion of reserve No. 1 can be maintained. Practically all of the reserve lying east of section 36—31—23, except section 1—32—24, and the north 160 acres of section 1—32—24. The Pan American, however, has a preferential lease to portions of that reserve. If it is to be maintained as a reserve, the provisions of that preferential lease would have to be nullified.

"However, it is my opinion, and the opinion of oil experts I know, that the Teapot Dome is not now in danger of being drained. Wells operating around it are at a considerable distance."

Robert Cary, Governor of Wyoming:

"I believe there is no chance of the Salt Creek field draining the Teapot Dome. To use this oil now may mean that at some time this country may be seriously embarrassed in a war for lack of fuel for its Navy. No one can justify the bartering away of valuable natural resources, the property of the State and the Nation."

G. B. Morgan, State geologist of Wyoming:

"My opinion is that Teapot Dome and Salt Creek are separate structures, with practically no possibility of draining Teapot through Salt Creek Wells."

Ex-Gov. R. B. Brooks, of Wyoming:

"There is no possibility of outside wells draining the Teapot Dome, and this Government drainage argument, which probably applies in California, falls flat."

Senator Kendrick, of Wyoming:

"But this (drainage) is not the condition that prevails in the Teapot Dome. There, if I am correctly informed, no wells whatever have been drilled to production, and no wells have been drilled in the vicinity through which by any possibility this reserve could be drained. It would appear, therefore, that there is no danger of the oil in the Teapot Dome being removed until the Government acts. All the land in this field is owned by the Government, and no one may remove the oil until the Secretary of the Interior and the Secretary of the Navy shall consent.

"It has been asserted in a statement emanating from the Department of the Interior that the Teapot Dome is being tapped by wells in the adjacent Salt Creek field, but the opinion of no geologist has yet been presented in support of this view, while the State geologist of Wyoming and all the independent oil operators who have knowledge of local conditions are a unit in saying that the Teapot Dome can not possibly be tapped by any well that has yet been drilled.

"Drainage of Teapot from the Salt Creek field is possible only from 360 acres adjoining the naval reserve. It was admitted that a single well could not drain more than 10 acres. Even if drainage would result from drilling on these 360 acres, the loss to the Navy would be infinitesimal."

National Producers' Association: "There exists no emergency or necessity which would warrant the opening of the naval reserves at this time."

Mr. Robert C. Bell: "The only excuse with a semblance of plausibility that has been offiered by the Secretary to justify the leasing of the reserve is that the structure was being drained by outside wells, and this positively is not true. Some of the best geologists in the country are authority for this assertion and recent developments confirm it. In the last several weeks wells have been drilled that have a tremendous gas pressure and produce thousands of barrels of oil daily. This is conclusive evidence that there has been no drainage. Moreover, experts of the Interior Department admit that there could not be drainage to exceed 15 per cent of the oil. If they are correct, this 15 per cent would not have been drained in a thousand years; and yet would have profited by conserving the other 85 per cent.

"Production recently has been obtained in a well on section 20, township 39, range 78, which is in or near the 'saddle'; and this fact is advanced in support of the contention that the Teapot structure is being drained. As a matter of fact, the naval reserve covers not only the whole of the Teapot structure, but extends far enough northward to cover also a small portion of the Salt Creek structure. It is our opinion that the well on section 20 taps—not the Teapot structure—but the extreme southern end of the Salt Creek structure, and that it takes no oil whatever from the

Teapot structure proper. But it is conceded that not more than 15 per cent of the oil can be drained from the reserve. Admitting that to be true, that quantity is not enough to justify the opening of this great natural storage of a product so necessary to our Navy. The best answer, however, to this proposition, assuming there is drainage to the extent of 15 per cent, is that there are no privately owned lands adjacent to the naval reserve, and the only wells that can do any draining must be on oil lands owned by the Government and leased by it under the act of February 26, 1920. The leases to those adjacent lands provide for a larger royalty than does the lease to Sinclair.

"But if we assume that such wells would have tapped the Teapot structure, even then they would not have drained it in a thousand years. Where wells have been producing in the Salt Creek field for many years there is no indication of drainage or reduction in gas pressure 2,600 feet away.

"From the foregoing it appears that there was at least a reasonable doubt as to the danger of serious loss by drainage from Teapot Dome, that the danger of loss was not immediate, that the control of such drainage as was threatened was a subject that might well have been considered by the Government, and that competent evidence which would have disputed the decision to lease this reserve was available."

Fourth. The pipe line:

Mr. Fall and the Navy Department have said that the agreement of the Sinclair interests to build a pipe line connecting the Wyoming fields with eastern markets influenced their decision for the leasing of Teapot Dome, because this will result in a higher price of oil from the Wyoming fields, including the Salt Creek Field. Inasmuch as these reserves were established "for the exclusive use and benefit of the United States Navy," the improvement in Government royalties from the Salt Creek Field is not a purpose for which the reserve was established. Moreover, there is evidence that this pipe line would have been built regardless of the Teapot Dome lease. This is contained in a statement by Mr. R. W. Stewart, chairman of the board of directors of the Standard Oil Co. of Indiana, in hearings before a subcommittee of the Committee on Manufactures of the United States Senate, Sixty-seventh Congress, Senate Resolution 295. Mr. Stewart's company has a 50 per cent interest in the Sinclair pipe line to the Wyoming fields. His testimony is as follows:

"MR. ROE. You will have the only pipe line into that territory [Teapot field]?

"MR. STEWART. I have been told that the Sun Dance people are contemplating building a pipe line, and I am also told that other people are contemplating building a pipe line. * * * Those rumors have been existent for months up there. I think ever since I knew that there was production up in Wyoming I have had in the back of my head the possibility of a pipe line proposition up there.

"MR. ROE. Then, quite aside from the exploitation of the Teapot Dome field, you feel that a pipe line into the Wyoming field, connecting up with the mid-continent is a justifiable undertaking, do you?

"MR. STEWART. Oh, I think it is a justifiable undertaking.

"MR. ROE. The building of the projected pipe line by the Standard and Sinclair interests in the Teapot Dome field was not brought about by the opening up of that field, was it?

"MR. STEWART. Well, my understanding about that matter was that Sinclair or his company, the Mammoth Co., made a contract when they secured the Teapot lease that they should build a pipe line.

"MR. ROE. I so understand. But you say as I understand you, quite

aside from that, the quantity of oil in the Wyoming field which had no pipe line outlet justified the building of the pipe line anyway?

"MR. STEWART. I think so."

Even had this pipe line not come in the natural course of events it was within the power of the Interior Department to have secured it without the Sinclair lease, as has been suggested by Mr. R. C. Bell, in the public press, as follows:

"Permit us to suggest what might have been done if the Government desired a pipe line from the Wyoming fields to eastern markets and wanted to catch the alleged drainage from the naval reserve. The Salt Creek field covers 15,000 acres; the Government's royalties now would amount to 25,000 barrels daily if the wells were operated to capacity; more than 100 new wells are being drilled at this time; the field is not one-third drilled; and it is believed that large quantities of oil will be produced in this field for at least a quarter of a century. The Government has a right to demand its royalties in kind, which, with the oil from a row of offset wells along the northwestern end of the reserve, would be enough to justify the building of a refinery in Wyoming, or a pipe line from the field to connect with the pipe line to the east."

Fifth. Adverse claims affecting the Navy's title to Teapot Dome:

"Mr. Robert C. Bell, who has previously been cited, was special assistant to the Attorney General in charge of withdrawn oil-land matters in Wyoming under the last administration. He is accordingly well informed on all questions relating to oil lands and oil policies in Wyoming, and is particularly competent on questions of title in the Wyoming reserve. He has denounced the Sinclair lease as a clandestine violation of the public interests."

Commander Stuart states as follows:

"The statement that there were claims on reserve No. 3 deserving serious consideration and deliberation is amazing. I am familiar with these claims and a complete record thereof is in the Bureau of Engineering. The claims are absolutely worthless and practically everybody who knows anything about them will admit it, no matter what Government department they are in. There is a report by a Department of Interior official on file in the bureau on this subject and it establishes without any equivocation that the so-called equities of the claimants are worthless."

"This report was written about 1916, I think."

Sixth Oil tank construction:

Had the customary method of building oil tanks (by congressional appropriation) been unavailable there is reason to believe that the necessary tanks could have been constructed with royalties from offset wells in No. 1 and No. 2 reserves.

10. In previous correspondence I have endeavored to persuade the department to action which I believe to be necessary in order that the Navy's interests in its fuel reserves may properly be protected. I believe it necessary for the department now to take positive action to insure the future of our naval shale reserves, which are of great potential value. Their future is shadowed by the position which the department has taken with respect to the petroleum reserves.

11. What has happened to the petroleum reserves indicates very clearly the necessity of returning the reserves to the status of control which existed prior to May 31, 1921. Unless our organization provides training of naval officers for the administration of the shale reserves, the Navy's resistance to the exploiting of these reserves will be weakened.

12. In this connection, without any reflection on the patriotic motives of employees of the Department of the Interior, it should be recognized that employees of that department who have to do with the fuel reserves

are to a considerable extent temporarily in the employ of the Government, and that a number of them have left the Government service to be employed by oil companies. I note from the press that the Secretary of the Interior who conducted the negotiations leading to the lease of Teapot Dome to Mr. Sinclair has, since leaving the Cabinet, been associated with Mr. Sinclair.

13. Their viewpoint is not apt to be that of the naval officer, and yet, as has happened with the petroleum reserves, their statements may be potent as affecting the disposition of the reserves.

14. The viewpoint of the naval officer with respect to questions of national security has been well expressed by the late Rear Admiral Harry S. Knapp as follows:

"Naval officers have a lifelong responsibility for the security of the Nation, in which respect they, in common with their brothers in the Army, are in quite a different position from that of any other persons in the Government. Questions of immediate expediency do not have much weight with them, and they are not perhaps so inclined to take chances with national security as those having a shorter tenure of office. Upon them is bound to fall the brunt of an underestimate of the necessity for defensive measures. That they are conservative is the natural consequence."

15. The newly established Alaskan reserve should not, I think, be considered by the department as replacing our domestic reserves. A fundamental requirement of a naval petroleum reserve is that it should be contained within continental limits. This is because in time of war we can not depend on sources of supply involving transportation by sea unless we have command of the sea.

16. The new reserve is on the Arctic coast of Alaska, nearly 1,000 miles from the nearest open port and remote from the railroad. Transportation of oil from this reserve must involve passage through British Columbia or by sea. It is not a proven oil field, and if oil is found there it will be very expensive of transport. I am informed that the mean annual temperature on this reserve is 12° F., and that the ground is permanently frozen to a depth of 600 feet; that the coast is without harbors, being a region of mud flats and sand spits, that it is open to navigation of light draft vessels for not more than two months of the year. With these conditions the removal of oil from this reserve will be difficult and expensive, and in time of war precarious.

17. Mr. Sinclair has valued the Teapot Dome lease at more than $100,000,000. The president of the Salt Creek Producers' Association has stated that the lease is of a reasonable value of $500,000,000.

18. Whatever may be the value, I feel that the method of handling the reserves subsequent to the Executive order of May 31, 1921, is deficient in that it has not provided for the testing of the arguments of those who have sought to exploit them.

19. The surest method of preventing a similar dissipation of the shale reserves is now to discover the conditions that caused and permitted the exploitation of the petroleum reserves and to insure that these conditions shall not again prevail.

J. HALLIGAN, JR.

JULY 13, 1923.

From: Secretary of the Navy.

To: Capt. John Halligan, Jr., U. S. N., U. S. S. *Detroit*, care United States naval inspector of machinery, Bethlehem Ship Building Co., Quincy, Mass.

Subject: Naval petroleum reserves.

Reference: (*a*) Letter of Captain Halligan on above subject, dated January 23, 1923.

Inclosures: (A) Copy of chart referred to on page 5.

1. Receipt is acknowledged of reference (*a*). The department appreciates the spirit which caused this letter to be written and has given it careful consideration.

2. With respect to the present policy of the Navy Department in the matter of handling naval petroleum reserves, it appears from your letters that you are not convinced of the truth of the reasons and consequent logic in deducing the present policy from such reasons; also it would appear that you believe the Navy Department does not have or retain control of the naval petroleum reserves.

3. In May, 1921, the question as to custody and administration of naval reserves land was brought before the Secretary of the Navy. After thorough consideration, the Secretary of the Navy concluded that the Department of the Interior was the proper department to protect and conserve the naval oil reserves of the United States. The Department of the Interior is charged with the custody of all other public lands of the United States, including all general petroleum reserves, and thus having specially trained field and office forces for that work and being otherwise fully equipped for handling public lands and petroleum reserves, it is the most logical and appropriate department to protect the interest of the Navy with respect to its oil lands. The area of general petroleum reserves in custody of the Interior Department on December 1, 1921, was approximately 6,600,000 acres. The total acreage withdrawn for naval petroleum reserves was 209,095 acres, including 132,000 acres of oil shale reserve. Thus, it is seen that the Interior Department is so equipped and has already in its keeping such vast interests in Government oil lands that for efficiency and economy the Navy interest in oil lands can be and should be properly intrusted to the Interior Department. The President of the United States approved of the above conclusion and on May 31, 1921, issued the following Executive Order No. 3472:

"Under the provisions of the act of Congress approved February 25, 1920 (41 Stat. 437), authorizing the Secretary of the Interior to leave producing oil wells within any naval petroleum reserve; authorizing the President to permit the drilling of additional wells or to lease the remainder or any part of a claim upon which such wells have been drilled, and under authority of the act of Congress approved June 4, 1920 (41 Stat. 912), directing the Secretary of the Navy to conserve, develop, use, and operate, directly or by contract, lease, or otherwise, unappropriated lands in naval reserves, the administration, and conservation of all oil and gas bearing land in naval petroleum reserves Nos. 1 and 2, California, and naval petroleum reserve No. 3, in Wyoming, and naval shale reserves in Colorado and Utah, are hereby committed to the Secretary of Interior subject to the supervision of the President, but no general policy as to drilling or reserving lands located in a naval reserve shall be changed or adopted except upon consultation and in co-operation with the Secretary or Acting Secretary of the Navy. The Secretary of the Interior is authorized and directed to perform any and all acts necessary for the protection, conservation, and administration of the said reserves, subject to the conditions and limitations contained in this order and of the existing laws or such laws as may hereafter be enacted by Congress pertaining thereto.

"WARREN G. HARDING.

"THE WHITE HOUSE."

4. It will be noted that the law provides that the control of naval petroleum reserves is vested in the Secretary of the Navy, and it so remains, with the details of administration carried out by the Department of the Interior.

5. At the time of issuing this Executive order it was necessary for the Navy Department to determine in detail the policy that it desired the Interior Department to carry out in its administration of the oil reserves. In reviewing the fuel reserve situation the following conditions became evident:

(*a*) The navy had no guaranty as to what amount of reserve fuel it had stored underground, nor at what rate of production this fuel could be obtained for use by the Navy.

The difficulty of estimating oil available underground is recognized by the United States Geological Survey in the following letter:

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
OFFICE OF THE DIRECTOR,
Washington, December 6, 1912.

The honorable the SECRETARY OF THE INTERIOR.

SIR: As a result of recent investigations of conditions in naval petroleum reserve No. 1 in the Elk Hills, Calif., by the Geological Survey, the difficulty of estimating definitely the quantity of oil available within this reserve has been developed more fully than heretofore. It is deemed the part of prudence, therefore, to add to the area especially reserved in order that there may be as complete assurance as possible that the United States retains control over a body of fuel oil adequate for the future needs of the United States Navy. I have therefore prepared and recommended for submission to the President the following additional order of withdrawal, involving approximately 29,541 acres in the Buena Vista Hill, Kern County, Calif.

GEO. OTIS SMITH, *Director.*

(*b*) A logistic study of the probable campaigns in the Atlantic and Pacific shows clearly that facilities must exist for the stowage of large quantities of petroleum products, located in the various strategic areas, and ready for immediate use.

(*c*) Existing and continuing drainage and depletion of naval reserve oil by wells drilled on private land adjacent to naval oil reserve land was proved.

The attention of the Navy Department was invited to the loss by drainage in the naval petroleum reserves in California in a very complete report submitted by Mr. M. L. Requa on December 16, 1916. Mr. Requa is one of the very noted oil experts of the United States. The Requa report will be found as Exhibit C in Senate Document No. 210 of the Sixty-seventh Congress.

The Secretary of the Interior, Franklin K. Lane, in letter dated August 1, 1917, testifies as to the "universal testimony of the geologists" in regard to the California naval reserves. Copy of his letter follows:

"The proposition which I have made to the President regarding the oil situation in naval reserve No. 2 is this:

"1. That every man who in good faith went upon the ground prior to the original withdrawal and either before that time or since has opened a producing well shall have a lease from the Government upon a one-eighth royalty for that well.

"2. That the Secretary of the Navy shall have the right to determine whether any new wells shall be driven upon that land and shall fix the royalty.

"3. That all who under the land laws are entitled to patents shall have their patents in accordance with the proclamation of withdrawal.

"4. That fraudulent locations shall have neither patents nor leases.

"The bill expressly excludes reserves Nos. 1, 3, and 4, which contain, according to our estimate, approximately 1,130,000,000 barrels of oil. Reserve No. 4, which is estimated to contain 1,000,000,000 barrels of oil, is a shale reserve from which by a patent working process oil is being produced at a reasonable cost (about $1.50 per barrel). This alone insures a future supply for the Navy. Reserve No. 1 is estimated to contain 100,000,000 barrels of oil. This is in California, near reserve No. 2. Reserve No. 3 is in Wyoming and has a complete dome containing 30,000,000 barrels of oil. Thus far all the suits brought against the claimants within reserve No. 2 have failed.

"We have 6,000,000 acres of supposed oil land reserved outside of the naval reserves which is useless in the country to-day, 3,000,000 acres of phosphate lands, and a large area of potash, essential to our needs, that is withdrawn, and if we can get by with any method of settling the dispute over reserve No. 2 a bill will pass under which all these lands can be opened under a leasing system. I fought for two years to convert Congress to the adoption of the leasing system as against the present transfer of title system, and when I was able to convert a House committee that was unfriendly to begin with and get the bill through the House and then a Senate committee that was unfriendly, I found all these resources kept out of the Nation's use because we had reserved a few thousand acres of especially rich oil land in California for the Navy, and it is universal testimony of the geologists that this land—by reason of the letting up of the gas pressure by the wells that are being pumped and the letting in of water and the constant pumping of patented lands—will be valueless in 15 or 20 years as any kind of reserve. When seepage of water takes place through an existing well the water drives out the oil. When the gas escapes it is easier for the water to force away the oil. And both of these things are taking place in reserve No. 2. There will be no oil there of any magnitude in a few years. The land should be pumped now or we will never find the oil where it is now.

"I am sending similar letters to Secretaries Baker, Daniels, Wilson, and Redfield."

"To Hon. D. F. Houston,
"Secretary of Agriculture:

"In connection with the drainage of oil from naval oil reserves, due to drilling on adjacent property by other parties, there has been forwarded to the Navy Department a chart, inclosure (A), prepared by representatives of the Bureau of Mines who are located at Bakersfield, Calif. The data used are from actual reports upon the wells in question.

"Section 36—30—24, lying just on the eastern border of naval petroleum reserve No. 1, is under production by the Standard Oil Co. A series of nine wells along the southern boundary of this section were drilled by the Standard between August, 1920, and September, 1921.

"Section 1—31—24, lying immediately to the southward of section 36—30—24 and within naval reserve No. 1, was drilled by the Pan-American Co. in October, 1921, a string of eight wells being drilled along the northern boundary to effect the Standard wells.

"In the following table, comparative production figures, as taken from the chart accompanying this letter, are shown:

Month	Section 1-31-24		Section 36-30-24	
	Average wells producing	Average production per month per well	Average wells producing	Average production per month per well
1920		*Barrels*		*Barrels*
August			¾	140,000
September			1¾	155,000
October			2	131,500
November			2¼	111,500
December			3	120,000
1921				
January			3¼	113,000
February			4	89,500
March			4½	75,500
April			6	63,000
May			6¾	41,600
June			7	47,000
July			7	45,000
August			8	32,500
September			9	27,500
October	1¾	5,000	9	23,000
November	5¼	6,000	9	19,000
December	6	10,500	9	13,000
1922				
January	7	13,000	9	12,500
February	8	12,000	9	11,000
March	8½	11,500	9	11,000
April	8	11,500	9	11,500
May			9	12,200

"From the above it appears that between August, 1920, and April 1, 1921, inclusive, from these wells closely adjoining the Standard got 4,930,500 barrels and the Pan-American got 480,000 barrels, a total of 5,410,500 barrels being produced in all. Had the offset wells been drilled promptly it may be assumed that from the start the production per well would have been as much on section 1—31—24 as on 36—30—24 or the Pan-American would have gotten about 50 per cent of the total or some 2,705,250 barrels, an increase of two and one-fourth million barrels over what Pan-American actually got. The royalties paid by Pan-American ranged in this case from 12½ per cent to 55 per cent or an average of about 33-1/3 per cent. The Navy would thus have saved 33-1/3 per cent of 2,225,000, equal to 741,670 barrels of crude of some $800,000 value. This was the cost of procrastination in this one instance."

The actual losses caused by delay in drilling naval reserves 1 and 2, as above noted, caused early attention to be directed to the possible or probable drainage of the Teapot Dome in naval reserve No. 3. Mr. C. H. Wegemann, one of the prominent official Geologists of the United States Geological Survey, in a report September, 1921, concerning naval reserve No. 3 states:

"It is obvious that as wells are drilled along the northwest line of the naval reserve part of the oil produced by these wells will be drawn from the naval reserve itself. As the amount of oil in the sand is reduced and the gas pressure also relieved, the water which is present in the sand on the flanks of the structure below the oil will gradually invade the oil sand. It will advance into the lowest part of the structure first. * * * It will creep into the saddle between the two structures on the northwest

quarter of section 28 and the east half of section 29. This invading body of water will gradually work its way across the saddle.

"The oil in the naval reserve in section 21, 30, and 29 will gradually be reduced in amount, due to the drainage of the wells along the northwest line of the reserve (outside the reserve and within the present privately owned or leased area) and the presence of the advancing flow of water."

Mr. Heald, of the Geological Survey, finds that part of No. 3 reserve in sections 17, 20, 29, 28, and 27 will presumably, but not certainly, ultimately be drained by wells outside the reserve, although he states:

"It is possible that faults known to exist but whose magnitude and importance are not known will protect these last-mentioned fractions from drainage from the outside."

He continues:

"That at the present rate of production, a year or more must lapse before any part of the reserve is appreciably damaged * * *."

Mr. Heald then states that—

"If appreciable loss becomes imminent due to intensive drilling near the line, fractions (within the naval reserve) should be leased in order given by him."

The chief oil and gas supervisor of the Bureau of Mines (formerly Mr. F. B. Tough, but now Mr. H. H. Hill), representing the United States Government in the Teapot Dome region, has official representatives checking oil, supervising drilling, making tests, collecting royalties, etc., all residing in Wyoming, and who every day during the year are actively in the field in the performance of their duties. To Mr. Tough instructions were given prior to September, 1921, and through him instructions given his subordinates to make a careful examination into the probable drainage of the Teapot Dome or naval petroleum reserve No. 3. The conclusion of the oil experts of the Bureau of Mines, communicated both in oral and written memorandum reports to the Secretary of the Interior, was that much more grave and serious danger of loss by drainage (especially through the extensive depletion of gas pressure) by outside drilling existed and exists than would be inferred from the foregoing statements. It was further shown that the leasing and drilling of fractional tracts inside the reserve, along its northern boundary, was not feasible because it would only serve as a partial protection against drainage and would stimulate the depletion of gas pressure within the undrilled portion of the reserve. Since gas pressure is the propulsive force which moves oil to the wells, the long delayed drilling of a large part of the reserve would result in greatly diminished rates of production, with slow and incomplete recovery, and increased costs per barrel of oil.

Further economic considerations influencing the development of reserve No. 3 as a whole were: The need for a common carrier pipe line to connect naval reserve No. 3 with outside markets, in order to create competition and thereby obtain an adequate price for Navy royalty oil. In this connection it was anticipated that such a common carrier pipe line connecting with the trunk lines of the mid-continent and a guaranty of mid-continent prices for the Navy royalty oil would also result untimately in an increased price for Salt Creek crude. Subsequent developments have proven this to be true. To obtain these benefits it was necessary to lease naval reserve No. 3 as a whole in order to offer sufficient inducement to a competitor not already entrenched in the Wyoming oil industry to undertake so expensive a project.

The financial magnitude of this venture will be appreciated when it is realized that careful estimates of the cost for the pipe line, storage facilities, field camp for housing employees, and the drilling of the first series of 20 wells amounted to between $25,000,000 and $30,000,000.

6. After consideration of the foregoing it was necessary for the Navy Department to give to the Interior Department the detailed policy and manner by which to administer the naval petroleum reserves, especially the steps to be taken to overcome the foregoing adverse conditions, in order to assure the Navy of (*a*) a real existing reserve of petroleum products in quantities and locations called for by approved naval plans for national defense and (*b*) means to avoid loss by drainage. The policy adopted might be called a defensive one, and was stated to the Secretary of the Interior by the Secretary of the Navy in his letter of 25 October, 1921, as follows:

"1. That arrangements will be made by the Interior Department to have naval petroleum reserves Nos. 1 and 2 drilled with offset wells in every case where adjacent property is drilled.

"2. That the amount of drilling, with consequent exhaustion of the reserves, shall be kept as low as practicable without risking the depletion of the reserves by other parties.

"3. That the equivalent of all royalty oil shall be delivered to the Navy in the form of fuel oil at such points on the Pacific coast as may be found necessary for naval use, and that this exchange of crude oil for fuel oil will be affected on as favorable terms as it is possible to obtain. It is presumed that under favorable circumstances and terms arrangements may be made for including points on the Atlantic coast for the delivery of an equivalent supply of fuel oil to the Navy.

"4. That the equivalent of so much of the royalty oil as is not used by the Navy is to be devoted to the construction of oil storage at Pearl Harbor, Hawaii, and at other points to be hereafter designated by the Navy Department. The cost of the tanks to be credited to the royalty due the Navy.

"5. That the Interior Department will exercise its best efforts to obtain for the Navy as large royalties and as favorable terms as practicable by public competition or otherwise.

"6. That the terms for conversion of the crude oil at the well to fuel oil at tidewater or in tanks to be provided by the lessor, will be submitted to the Navy Department for approval of the qualities, deliveries, engineering, and other features involved.

"7. That all leases and contracts, except as provided in paragraph 6, will be arranged and consummated by the Interior Department, copies of same being furnished to the Navy Department as a matter of information and record only.

"8. That every effort will be made by the Interior Department to expedite the solution of this problem so that fuel oil at Pacific tidewater in exchange for royalty crude oil may be delivered as soon as possible to naval vessels and so that the erection of suitable storage facilities for 1,500,000 barrels of fuel oil at Pearl Harbor may be undertaken and expedited.

"9. That the development of naval petroleum reserve No. 3 is not to be undertaken except to protect the Government against depletion of the reserve by other parties.

"10. The general intent of this agreement is to transform royalty oil into either (*a*) fuel oil for current naval use, or (*b*) fuel oil stored where required by the Navy as a reserve—the storage, of course, to be naval property and to accord with naval requirements."

In reply to this letter the Secretary of the Interior in letter dated October 30, 1921, stated to the Secretary of the Navy as follows:

"Responding to your request for information as to whether the policies set forth in the letter are agreeable to the Department of the Interior, I can say without hesitation that they are entirely agreeable and will be carried out to the very best of my ability."

7. The Navy Department in considering the situation of No. 3 reserve (known as the Teapot Dome) in Wyoming decided that serious drainage of the oil, together with the extensive depletion of gas pressure, in the Teapot Dome would be effected by the drilling outside of it, if energetic steps were not taken to drill the naval reserve, because it lies immediately to the southward and adjoins the Salt Creek Field, which is now under development. The decision to drill Teapot Dome was based upon reports of such liable geologists and experts as Mr. Carroll H. Wegemann, Mr. K. C. Heald, Mr. F. B. Tough, and Mr. A. W. Ambrose, these complete reports to be found in Exhibits G, H, and I, respectively, in Senate Document No. 210, Sixty-seventh Congress.

8. From the foregoing considerations it was decided to lease all of reserve No. 3 to one thoroughly responsible lessee having the financial strength to properly meet the Navy's requirements. In explanation of the negotiations preceding the leasing of the reserve No. 3, the following statement by Hon. Albert B. Fall is quoted from page 23 of Senate Document 210, Sixty-seventh Congress.

"It may be frankly stated that this entire matter was conducted by the Secretary of the Interior, as indicated, through conference in his office in Washington with representatives of at least three of the great oil companies of the United States outside of what is known as the Standard Oil Group."

"It may be as frankly stated that no prejudice against any of the Standard Oil companies caused the Secretary of the Interior to refrain from calling those companies in, but he did not so call them simply because of the fact that the Midwest corporation in Wyoming is generally understood to be a Standard Oil subsidiary, and then had, and now has, a monopoly of the oil production of the entire State of Wyoming.

The Mammoth Oil Co., a thoroughly responsible and financially strong organization, agreed to terms that were most favorable to the Government, and on April 7, 1922, a contract with that company was drawn up by representatives of the Navy, Interior, and of the company that provides for drilling the entire reserve. This contract has been published as Senate Document 196, Sixty-seventh Congress. Among the provisions of the contract the Navy royalty crude is to be valued the same as the highest price for similar grades of crude in the Salt Creek or mid-continent fields, whichever price is the highest; the royalty is to be calculated upon a sliding-scale basis, which is very favorable to the Navy; the lessee agrees, under certain conditions, to build a pipe line of 25,000 barrels per day capacity, connecting naval reserve No. 3 with a trunk line from the mid-continent field to Chicago. (This pipe line is now under construction.) In exchange for royalty oil produced the lessee agrees to construct facilities for oil storage at accessible ports on the Atlantic coast and the north coast of the Gulf of Mexico as designated by the Navy. This construction is being executed according to specifications of the Navy and supervised by Navy engineers. All storage facilities and the oil stored therein become the property of the Navy when accepted by it. Fuel oil is also to be delivered into this storage in exchange for Navy royalty crude. The basis of exchange is to be 1 barrel of bunker fuel oil A for 1 barrel of royalty crude of 34° Baumé or over, or 63 per cent of 1 barrel of such fuel oil for 1 barrel of crude royalty oil of less than 34° Baumé. Provisions are also made whereby the Government may receive payment of royalties in cash or the Navy may accept payment in refined petroleum products, such as kerosene, gasolene, and lubricating oils, the mode of payment being optional with the Navy. Numerous other privileges of importance are reserved to the Navy.

The Navy royalty oil from reserves Nos. 1 and 2 in California is also

exchanged according to contracts for fuel oil delivered in storage at Pacific ports.

In view of these conditions it is evident that the Navy is in effect exchanging under terms highly advantageous to the Navy uncertain and unprotected reserves of crude oil for positive reserves of fuel oil in steel storage under complete control of the Navy and immediately available in cases of emergency.

9. A great deal of criticism has been carried by the press since the contract with the Mammoth Oil Co. was made for development of naval reserve No. 3, but it is believed that this criticism is due either to ignorance of true conditions or to parties who are financially interested in the oil industry in that part of the country and now see some of their exorbitant profits about to suffer. It appears, however, that as the provisions of this contract and direct and indirect economic benefits to the oil industry resulting therefrom have become more generally appreciated a marked change in public sentiment has occurred. It is expected that the operation of the pipe line now being constructed from Teapot Dome will have a further beneficial effect on prices in Salt Creek field, and that the Government will profit thereby.

10. The following report of Mr. F. B. Tough shows the wisdom of the policy of the department in connection with naval reserve No. 3, because the evidence clearly shows this naval reserve was subject to drainage. The energetic steps taken in drilling the reserve have saved the Government a large sum and also insure a real reserve of oil above ground.

March 16, 1923.

Memorandum to the director.

Subject: Result of operations to March 3, 1923, Teapot Dome, Wyoming.

Drilling has been started by the Mammoth Oil Co., on 22 wells within naval petroleum reserve No. 3. Of these wells nine are producers of oil from the second Wall Creek sand, one is an oil producer from shale crevices, one is a gas well, four are water wells with no oil, and seven are drilling. The total feet drilled in all wells is 60,817.

In February, 1922, an estimate of the probable ultimate production from sands known to lie under Teapot Dome was made, based on the productivity of the same sands in the adjacent Salt Creek field. There being abundant data on Salt Creek, this method was not only the best to be followed but offered a more intimate comparison than is usually found for an undrilled area such as Teapot Dome at that time. In order to make that estimate conservative no account was taken of probable production from the Shannon sand, and the estimate of probable production per acre from the first Wall Creek sand as assumed as one-third less than for Salt Creek. Moreover, no account was taken of possible production from the Lakota sand, which is known to carry oil in the Salt Creek field. Recent drilling in the Teapot Dome has developed a number of facts which force a material production in our estimate or ultimate production from the reserve. These facts are:

(1) The first Wall Creek sand, from which 50,000,000 barrels of oil was expected, is water bearing and nonproductive.

(2) Instead of 5,670 acres, as the probable producing area of the second sand, we must now figure on only about 3,300 acres as within the water line. Of this area a considerable amount, estimated roughly at 400 acres, in the higher portion of the second Wall Creek sand, contains gas and not oil, thus leaving the difference but 2,900 acres as the probable productive area of the second Wall Creek sand.

(3) The average production of Salt Creek wells by actual production test in December, 1921, showed 353 barrels per day. Many of these have

been producing several years; some of them ten or eleven years; therefore it was reasonable to expect that the new wells from these same sands in an undrilled structure, such as Teapot, would have a much higher initial production than this average. Here, again, reasonable expectations have not been realized. An average of the second sand wells, now producing in Teapot, shows about 205 barrels per well per day. It may, therefore, be conservatively estimated that the average initial production per well per day in Teapot will not be more than one-third of the average initial daily production for Salt Creek.

The result of this greatly reduced initial production of wells means that the ultimate recovery per acre from the second Wall Creek sand will probably not exceed one-third as much as the same sand in the Salt Creek field. This sand seems to be of uniform thickness in the two structures, therefore, applying the one-third ratio, it will reduce the probable recovery of oil from second Wall Creek sand from 15,000 to 5,000 barrels per acre, or 2,900 acres at 5,000 barrels per acre equals 14,500,000 barrels, the estimated total. This is but 10.6 per cent of the earliest estimates which were conservative, according to the data then available.

In considering such an estimate as this it should be borne in mind that the wells already drilled are, for the most part, edge wells. No well has been drilled to the second Wall Creek and in what is expected to be the most productive part of the structure. Therefore, an estimate such as this, based on the average daily initial production of the wells now drilled, may be low. No account is taken of the small production known to be available from the Shannon sand. Due to the many uncertainties attendant on such estimates, this one is made merely as a guess for whatever use it may be to the Interior and Navy Departments.

Runs for Teapot naval petroleum reserve, State of Wyoming

Month	Producing wells	Production (barrels)	Government royalty	Value Government relating	Average price received by Navy	Average price, Salt Creek	Difference in price in favor of Mammoth contract
October, 1922	1 well, 2 days	830.16	189.73	$237.16	$1.25	$0.70	$0.55
November, 1922	2 wells	19,191.97	3,932.59	5,247.91	1.35	.70	.63
December, 1922	4 wells	17,221.16	2,772.56	4,119.72	1.49	.81	.68
January, 1923	6 wells	30,379.64	5,068.43	8,268.10	1.63	1.16	.47
February, 1923	6 wells	27,606.05	4,611.21	9,406.72	2.04	1.51	.53
Total		95,228.98	16,574.52	27,279.61			

In conclusion it is interesting to note that the much discussed area between the Salt Creek and Teapot structures, often referred to as the "Saddle," has been proved by the drill to carry oil and not water.

F. B. TOUGH.

11. As further evidence relating to the drainage of naval reserve No. 3, it is significant that on March 29, 1923, at a public hearing before the Secretary of the Interior, Hon. Hubert Work, Mr. M. J. Foley, supervisor of the Salt Creek Producers Conservation Committee, stated that drainage along the common boundary of the Salt Creek field and naval petroleum reserve No. 3 would occur either from the reserve to the Salt Creek field or from the Salt Creek field to the reserve according to the predominance of drilling and the rate of operating the wells.

12. Certain lands within the Territory of Alaska are probably oil-bearing lands. In order that the Navy might be fully protected against unforeseen needs for petroleum products, the Secretary of the Navy on February 8, 1923, addressed a letter to the Secretary of the Interior requesting the co-operation of that department in obtaining an Executive order by the President setting aside as a naval petroleum reserve certain lands in Alaska. As a result of this action, on February 27, 1923, the President issued an Executive order setting aside designated lands in the vicinity of Point Barrow, Alaska, which have since been designated as naval petroleum reserve No. 4. These lands will be thoroughly investigated for the Navy by the Department of the Interior through the experts of the United States Geological Survey to obtain more definite information as to their oil-bearing possibilities and means for their development.

EDWIN DENBY.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"Shaft Whipping." By Dr. B. L. Newkirk, *Mechanical Engineering*, May, 1924.

"The Solid-Injection Oil Engine." By H. F. Shepherd, *Mechanical Engineering*, May, 1924.

"The Scott-Still Motor Ship *Delius*," *The Engineer*, April 11, 1924.

"Reconditioning the Turbines of the S.S. *Mauretania*," *The Engineer*, April 18, 1924.

"Some Facts About the Naval Oil Leases." By Paul Woaton, *Power*, April 29, 1924.

"Fire Effect on Naval Targets and Coast Artillery Forts." By First Lieutenant C. E. Brand, C.A.C., First Prize *Journal* Essay Competition, 1923.

NOTES ON INTERNATIONAL AFFAIRS

FROM APRIL 23 TO MAY 23

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. NAVAL ACADEMY

EUROPEAN ELECTIONS

EXTREME PARTIES GAIN IN GERMANY.—In the German Reichstag elections held on May 5 both the Nationalist and the Communist parties gained at the expense of the Socialist and other moderate parties. The Communists returned four times as many members as in the preceding parliament, but still remain a negligible minority. While the shifts of strength indicated general discontent, there was no clear-cut expression of unwillingness to accept the "Dawes Plan." Even the Nationalist leaders, following the elections, recognized the necessity of acceptance, and stipulated only insistence upon certain concessions. Herriot, the New French Premier, declared that German Republicans would find him easy to deal with, but not so a German Government of reactionary tendency.

The six principal parties, in order from conservative to radical, elected delegates as follows: Nationalists, 96; Freedom Party, 32; Centrists, 65; Democrats, 28; People's Party, 44; Socialists, 100; Communists, 62.

Prospects indicated continuation of the Marx Coalition Government backed by the Center, People's and Democratic parties, with either Nationalist or Socialist support.

RADICAL VICTORY IN FRANCE.—The French election of May 11 was a decisive and surprising victory of the *bloc de gauche* parties over the *bloc nationale* supporting Premier Poincaré, involving a shift of about 100 votes, and indicated a swing of French sentiment toward a more conciliatory policy in international relations, especially in regard to the adoption of the "Dawes Plan."

It was practically decided soon after the election that M. Poincaré would resign the premiership on June 1 at the opening of Parliament, and would be succeeded by M. James Edouard Herriot, Radical Socialist Mayor of Lyons, and leader in the *Bloc de gauche* campaign. The make-up of the new cabinet was unsettled. A government of the Left under Herriot would command a majority of about fifty, with the help of the Communists, but without them only about twenty-five. On the other hand, a government formed by one the more moderate leaders, such as Briand or Painlevé, would draw support from the Nationalists and have a working margin of perhaps 150. Hence it was prophesied that Herriot's government would be short-lived.

The result of the election indicating parties by leaders, was as follows: Poincaré (six parties), 282; Herriot (Radical Socialist), 130; Briand, 104; Painlevé, 39; Communists, 29.

GERMAN REPARATIONS

ALLIES FAVORABLE TO "DAWES PLAN."—The replies of Italy, Belgium, Great Britain and France to the Reparations Commission note of April 17 recommending the "Dawes Plan," were in general favorable. Both the British and Italian replies favored adoption and immediate execution of the plan in its entirety. Premier Poincaré's note was more guarded, declaring that only when the Reparations Commission had indicated the matters within its jurisdiction and those to be settled directly by the Powers could judgment on the latter be made. In essence the difference between the British and the French attitudes was over penalties. France desired a definite program of penalties agreed upon in advance, including British agreement to co-operate in exploitation of the Ruhr in case of German default; and France also objected to evacuation of the Ruhr until Germany had "effectively put the plan into execution."

ATTITUDE OF NEW FRENCH MINISTRY.—From New York *Times*.—Paris, May 20.—The new government which will take power in France the first of June will, it is intimated by Left bloc leaders, abandon the Poincaré policy of military occupation of the Ruhr until France has received the total reparations due her. It will not, however, order immediate evacuation, but will probably evolve some formula saying the troops will be taken out when Germany has convinced France that she will carry out the provisions of the experts' plan.

Even though this will postpone exacuation of the Ruhr, perhaps for many months, it will, if pursued, represent a radical departure from the Ruhr policy of the past. It was M. Poincaré's policy that troops would remain in the Ruhr as a permanent guarantee of German payments. The attitude of the leaders of the Left is that the troops are in the Ruhr to insure Franco-Belgian direct exploitation and that if that direct exploitation gives way to another system of collecting reparations, namely, the Dawes system, there will be no further need for troops, provided, first of all, that the Allies agree to stand with France in advising Germany to pay and, secondly, if Germany shall have given a good first performance.

HUNGARY TO SETTLE AMERICAN DEBT.—From New York *Times*.—Washington, April 25.—The American Debt Commission today completed a settlement for funding the Hungarian debt to the United States and the President immediately sent it to Congress for ratification.

The agreement, which covers the first of the relief loans made by the United States, provides for repayment of the $1,939,753, principal and interest over a sixty-two-year period. A cash payment of $753 is arranged, and the remainder will be retired in annual instalments, with interest at three per cent over the first ten years, and three and one-half per cent thereafter.

Introduced into this funding settlement, the third to be consummated by the commission, is a provision designed to clear the way for flotation by Hungary of a national loan for reconstruction purposes. The agreement accords the Secretary of the Treasury the authority to release Hungarian

national assets from the priority of a first lien by the United States, provided other nations holding Hungarian obligations agree to co-operate likewise.

AMERICAN COMMISSIONER FOR HUNGARY.—Following the refusal of Mr. W. P. G. Harding to accept the position, Mr. Jeremiah Smith, another American, was appointed Commissioner General of Hungarian finances under the League of Nations rehabilitation plan. Mr. Smith is a Boston lawyer who has served in several finance commissions abroad. He will administer the $50,000,000 loan to Hungary.

UNITED STATES AND LATIN AMERICA

SHIP SEARCH TREATY IN EFFECT.—On May 22 President Coolidge issued a proclamation putting into immediate effect the treaty signed on January 23 between the United States and Great Britain to aid in the prevention of liquor smuggling into the United States. It was announced that another treaty had been signed with Sweden, similar to the treaties on ship search already negotiated with Great Britain and Germany. The essential provisions of the treaty with Great Britain are Articles I and II, as follows:

Article I.

The high contracting parties declare that it is their firm intention to uphold the principle that three marine miles extending from the coast line outward and measured from low-water mark constitute the proper limits of territorial waters.

Article II.

(1) His Britannic Majesty agrees that he will raise no objection to the boarding of private vessels under the British flag outside the limits of territorial waters by the authorities of the United States, its territories or possessions in order that inquiries may be addressed to those on board and an examination be made of the ship's papers for the purpose of ascertaining whether the vessel or those on board are endeavoring to import or have imported alcoholic beverages into the United States, its territories or possessions in violation of the laws in force. When such inquiries and examination show a reasonable ground for suspicion, a search of the vessel may be instituted.

(2) If there is reasonable cause for belief that the vessel has committed or is committing or attempting to commit an offense against the laws of the United States, its territories or possessions prohibiting the importation of alcoholic beverages, the vessel may be seized and taken into a port of the United States, its territories or possessions for adjudication in accordance with such laws.

(3) The rights conferred by this article shall not be exercised at a greater distance from the coast of the United States, its territories or possessions than can be traversed in one hour by the vessel suspected of endeavoring to commit the offense. In cases, however, in which the liquor is intended to be conveyed to the United States, its territories or possessions by a vessel other than the one boarded and searched, it shall be the speed of such other vessel, and not the speed of the vessel boarded, which shall determine the distance from the coast at which the right under this article can be exercised.

Other clauses of the treaty provide that the U. S. laws shall not be applicable to liquor on British ships listed as ship's stores or cargo destined for ports foreign to the United States, and that liquor may be carried under seal through the Panama Canal.

NO MODIFICATION OF JAPANESE EXCLUSION MEASURE.—By overwhelming majorities, the United States House and Senate on May 15 approved the conference report on the Immigration Bill, disregarding the President's request that operation of the Japanese exclusion clause should be deferred until March 1925, and setting the date instead as July 1 of this year.

PRESIDENT WILL CALL ARMS CONFERENCE.—From New York *Times.*—Washington, May 23.—President Coolidge has virtually decided to call another conference of the Powers to consider further limitation of naval armament. Information to this effect has been received by the members of the naval committees of Congress.

Formal decision in the matter is withheld pending acceptance by Europe of the Dawes report dealing with German reparations, and action by Congress on the bill authorizing an expenditure of $120,000,000 for the construction of eight modern scout cruisers.

If Europe acts promptly on the Dawes report and Congress passes the Naval Building Bill at this session, as now seems probable, the President is expected at once to request the Powers to join in a conference, with a view to perfecting a treaty limiting the construction of all types and sizes of sub-surface and surface craft of ten thousand tons standard displacement or less. The treaty on the limitation of armament negotiated early in the Harding administration deals only with capital ships.

There is good authority for the statement that the President is committed to another armament conference.

In urging the passage of the bill providing for new cruisers, the administration is actuated by a desire to be placed in a position where it will have something to offer by way of concessions in the event that a conference is assembled.

Heretofore, the President, in discussing the question of further limitation of armament, has expressed the opinion that it was useless to consider seriously such a venture until Europe had in some manner solved the problem of German reparations. He is now said to entertain the view that general adherence by Europe to the Dawes plan would effect such a change in economic conditions, notably in Germany, that the time might soon be propitious to call another conference to supplement the Washington Treaty of 1921-22.

HONDURAS FACTIONS SIGN AGREEMENT.—On May 3, at Amapala, aboard the U. S. Cruiser *Milwaukee,* a treaty of peace was signed by representatives of the three warring political factions in Honduras. The agreement was brought about by the United States representative Mr. Sumner Welles, who had been sent to Honduras by President Coolidge to attempt mediation. Delegates from Salvador, Guatemala, Nicaragua, and Costa Rica, also took part in the conference.

The treaty provides that General Vincente Tosta shall become Provisional President, and shall call for a new presidential and congressional

election, in the meantime according amnesty to all political offenders. The treaty, which is signed by the United States and Central American representatives, as well as those of the Honduras factions, is guaranteed by all the signatories. It is expected to end the civil war which has continued since the failure of any presidential candidate in the last election to secure a constitutional majority.

REVIEW OF BOOKS

NORIE'S NAUTICAL TABLES. Omray, Laurie, Norie and Wilson, Ltd., London.

REVIEW BY LIEUTENANT COMMANDER R. E. ROGERS, U. S. NAVY

The preface to this most comprehensive book states that there has been a purpose to bring "under one cover the most complete set of Nautical Tables in existence." Upwards of seven hundred pages have been devoted to this end, which has, beyond doubt, been adequately achieved. Demonstrations are given covering a wide variety of methods for solutions of sights, and tables are provided accordingly. Considerable stress is laid on the cosine-haversine solution for the general case of the astronomical triangle. Dead reckoning, piloting, and such incidental features as great circle sailing and star identification are adequately provided for. As a typical example of the wide variety of tables, two entirely separate methods and sets of tables are provided for azimuth. One method for azimuth is from a set of spherical traverse tables, which tables are also the source for great-circle courses.

Several features, relatively new, greatly enhance the value and interest of the book. Prominent among these are: an extension of ex-meridian tables, considerably beyond the scope of the familiar *Bowditch;* a ready method for converting radio bearings to mercatorial; and a new method for computing zenith distance. Credit for this new method and its accompanying table is given by the authors to Captain Ogura of the Japanese Navy. The method affords a compromise between two general processes for solution of sights—between the rigorous solution involving logarithms and natural functions entirely, and the solutions "by inspection." The new method, as demonstrated, involves the assumption of latitude to the nearest whole degree, and a new assumption of longitude, in order to provide hour angle to correspond to tabular values. Starting with the selected latitude and hour angle, a table is entered and in adjacent columns there are picked out a logarithm and a number, the latter expressed in degrees and minutes. To the number is applied the declination, and a log secant of the result is picked out and added to the first log. The result is the log secant of the zenith distance. The process is evidently shorter than any of the other so-called rigorous solutions, and the sacrifice in accuracy is negligible. While evidently original, the process is not strictly unique. It is based on the solution of the astronomical triangle by dropping a perpendicular from the zenith to the meridian of the observed body and solving the resulting right triangles in succession,

as in the familiar Aquino methods. The essential point of difference lies in the use of logarithms in the new process, while in the Aquino methods the solution is by inspection throughout.

It appears reasonable that the types of tables and solutions best suited to the individual navigator can be determined only by personal trial by the individual concerned. For those who have not definitely and finally decided the matter for themselves, and this applies particularly to beginners, a perusal of Norie is decidedly in order. Although implied above, it is worthy of repetition here that the book, with the aid of the *Nautical Almanac,* provides a complete equipment for all navigational calculations.

JANE'S FIGHTING SHIPS, 1923. Edited by Oscar Parkes, O.B.E., M.B., Ch.B. and Francis E. McMurtrie, A.I.N.A. Sampson Low, Marston and Company, Ltd., London. 401 pages.

Jane's Fighting Ships, 1923, follows the same general line as the previous issues. It contains no radical departures from the lines laid down in last year's book.

At the request of Dr. Oscar Parkes, editor of the 1922 edition, Mr. Francis E. McMurtrie has joined the editorial staff, and this year's volume is the result of their joint effort, Mr. McMurtrie taking over the text of the book, and Dr. Parkes handling the illustrations and plans.

The chief improvements noted are in the illustrations used. As has always been the policy, considerable space is devoted to illustrations of the larger and more important ships. The photographs and illustrations used are excellent and well chosen. This is particularly true as regards those of the aircraft carriers.

Although, on account of the Washington Naval Treaty, there have been very few new ships completed during the last year, there have been many and varied changes and improvements made on old ships in practically all navies. These have been carefully and correctly noted by the editors in the text and the illustrations.

Every effort has been made to make *Jane's Fighting Ships* a complete and authentic encyclopedia of the navies of the world, and the success of this year's book in this respect makes it indispensable to anyone interested in naval affairs.

H. B. H.

SALEM VESSELS AND THEIR VOYAGES. A History of the *George, Glide, Taria Topan,* and *St. Paul,* in trade with Calcutta, East Coast of Africa, Madagascar, and the Philippine Island. Series II. By George Granville Putnam. Salem, Mass.: The Essex Institute, 1924. $3.50.

In seventeen years, at Frye's Mills, Salem, Ebenezer Mann built forty-one vessels. In twelve years, likewise at Frye's Mills, Christopher Turner

built eighteen vessels. Turner, who probably came to Salem as an apprentice to Mann, ended his career of ship-building in 1812. Of this total of fifty-nine vessels, brigs and schooners predominated, but there were two barques and eleven ships. The largest was the ship *Hunter*, of 296 tons, but some of the brigs and schooners were nearly as large.

"In the year 1807, in the fourth quarter, thirteen ships, barques and brigs arrived in Salem from Calcutta and Sumatra. The ship *Eliza*, of 512 tons, landed more than one million pounds of pepper. . . .

In the same year 236 vessels entered Salem from foreign ports, being the greatest number which ever entered at this port in any one year, and the duties, $1,152,000, were greater than in any other year."

In 1796 the harbor of Manila saw for the first time an American vessel flying the American flag. This was the ship *Astrea* of Salem, Captain Henry Prince, and she returned to Salem with a cargo of 750,000 pounds of sugar, 63,695 pounds of pepper, and nearly 30,000 pounds of indigo. From 1797 down to 1858, there were eighty-two entries from Manila at Salem. After 1858, though Salem merchants continued in the Philippine trade, their vessels entered at other ports.

Madagascar, Zanzibar, and Muscat were other emporia where Salem vessels were often seen. The barque *Taria Topan*, of 632 tons, "named in honor of a high-minded Hindoo merchant of Zanzibar," made twenty-six voyages to that part of the world between 1870 and 1892. Salem-built and Salem-owned, she nevertheless made most of her voyages from Boston, and it was to Boston that she brought, in 1873, "one of the most valuable cargoes ever received here from Arabia, consisting of ivory, ebony, dates, gum copal, etc. Among the leading items of her cargo are 6,035 frails of dates, 1,600 bags of cloves, and 3,529 blocks of ebony."

The book before me, from which the above excerpts and statistics are taken, relates the life history of four long-lived and successful vessels of Salem's great merchant fleet. The records are based upon the ship's logs, upon personal narratives, and upon various other sources of information. The heroines of the tale are the ship *George*, 328 tons (1814-1838), of Calcutta trade; the barque *Glide*, 480 tons (1861-1888), which made thirty voyages in the trade with the East Coast of Africa and the East Indies; the barque *Taria Topan*, already mentioned; and ship *St. Paul*, 463 tons (1833-1851), which plied in the Manila trade.

Of the four ships whose careers are followed, three came to tragic ends. The *Glide* was wrecked near Tamatave, Madagascar. The *Taria Topan*, after being sold by her Salem owners, went aground on Horn Island en route to Buenos Ayres, and the *St. Paul* suffered a similar disaster on Masbata Island in the Straits of San Bernardino. Only the *George* met the prosaic fate of being condemned and sold for junk.

There is much incidental information about numerous other ships, about enterprising Salem merchants and dauntless Salem sea-captains, about trade and trade routes and sailing time, and many a statistical-looking page conceals touches of heroism and romance. J. W. P.

"FREDERICK W. TAYLOR, FATHER OF SCIENTIFIC MANAGEMENT." By Frank B. Copley. Price $10.00—two volumes. (Harper's.)

This life of Taylor by Copley does two things at the same time. It describes the activities and character of an engineer who almost surely will be ranked by coming generations as one of the greatest men of the world, and it shows how Taylor worked out the principles and methods of handling men, and just what those are and how they work.

It is an astonishingly honest, and hence interesting, life story of a most unusual and vivid man. Copley frankly acknowledges to begin with that he is enthusiastic over the soundness and greatness both of Taylor's personal character and of his work. The result is a real biography of a real man—a hard hitting man we can't help but respect and admire. Miss Ida Tarbell is quoted as saying, "Mr. Taylor never seemed to me more of a gentleman than when he was swearing."

Both our Army and Navy are primarily interested, as was Taylor, in finding out how best to handle men and to handle machinery—and, usually, how best to handle them together. So it was natural, almost inevitable, that he should have had extensive dealings and friendships with both services. And those service matters are given in considerable detail.

One long chapter is given to Taylor's connection with the Navy, and one to the Army. Most of the navy chapter gives Taylor's relations to Admiral Goodrich's reorganization of the New York Yard, and the subsequent extension of that as the "Newberry plan," and then the opposing "Meyer plan." The army chapter describes General Crozier's introduction of scientific management into the arsenals, and the objections made by some labor leaders. The inside facts and reasons controlling those service questions are given, Taylor being at the bottom of them. He also dealt with education extensively, advocating for all colleges the West Point and Annapolis discipline, showing why.

Taylor's principles and methods of handling men primarily aimed at what he called the "promotion of harmony," and are based on justice and common sense which is the opposite of coddling and slackness. There is no space here even to summarize those principles which Taylor worked out with such extraordinary ability, and which Copley presents so entertainingly. It is the most intelligible and directly applicable book on handling men the present reviewer has read.

Copley is a trained and successful popular writer, and his long study of Taylor has given him much of Taylor's pungent and vivid speech, so this life he writes of Mr. Taylor is more interesting than a novel, entirely apart from the fact that it deals much with our own friends and affairs, and is in a high degree professionally useful to us as a treatise on handling men.

S. K.

SECRETARY'S NOTES

Membership

Present Membership: 4,327. Changes since last report: New Members, 4. Deaths, 2. Total Increase, 2.

Membership and Subscriptions

There has been a certain amount of misunderstanding in some quarters regarding the change in subscription rates to the PROCEEDINGS, a notice of which has been published in these notes for a number of months. Membership in the Naval Institute, as heretofore, includes a subscription to the PROCEEDINGS, and the cost of membership (membership dues) remains unchanged. Regular membership is available only to officers of the Navy, Marine Corps, and civilian officers attached to the naval service. Associate membership is available only to officers in allied military services, or to persons in civilian life who are interested in "the advancement of professional, literary and scientific knowledge of the Navy," and only after application and election as such. Membership is entirely personal, and continues until resignation in writing has been received.

Subscription is available to any organization or person and is automatically discontinued at expiration. The subscription rate is $5.00 per year.

The special subscription rate of $3.50 per year is available only to members who wish to send gift subscriptions to their relatives or friends, in order to acquaint them with naval life and conditions. It is not available to societies, subscriptions for which must be at the regular rate.

Resignations from Board of Control

Commander John Downes, U. S. Navy, and Commander W. R. Van Auken, U. S. Navy, submitted their resignations as members of the Board of Control, due to detachment from the Naval Academy. The Board accepted both resignations with regret.

Articles The Institute desires articles of interest to all branches of the service, including the reserve force. Non-members as well as members may submit articles, and authors receive due compensation for articles published. Compact, well digested articles are more likely to be accepted for early publication. In accepting articles for publication, the Institute reserves the right to have such articles revised or rearranged, where necessary, in order to bring them up to the required standard of articles published in the PROCEEDINGS—the cost, if any, to be deducted from the compensation due the author.

Reprints of Articles Twenty copies of reprints are furnished authors free of charge. Additional copies to the number desired will be furnished at author's expense, provided request is made before going to press.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid for at approximately one-half the rate for original articles.

Book Reviews As soon as practicable after the publication of books on subjects of professional interest, the Institute aims to publish authoritative reviews of them.

Address of Members In the past, many errors have resulted from the habit of changing an officer's address as soon as his transfer orders are published in the papers. No change will be made in the future except upon receipt of the Navy Directory, or notification by the member concerned. Reliance upon the former method may, in extreme cases, mean a delay of almost four months.

To insure the prompt delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers *notify the Secretary and Treasurer without delay of every change of address.* No responsibility can be accepted for failure to receive the PROCEEDINGS, where members fail to comply with this rule. Changes of address should reach the Institute by the 25th of the month, to be effective for the issue of the PROCEEDINGS of the following month.

Coupons for Applications

For the convenience of members making application for membership or for subscription, or informing the Institute of changes of address, a number of blank forms will be found elsewhere in this issue. It is hoped that members will take full advantage of these in order to reduce clerical work of all concerned.

H. G. S. WALLACE,
Commander, U. S. Navy, Secretry and Treasurer.

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